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Towards a sufficiency-driven business model: Experiences and opportunities

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ABSTRACT

Business model innovation is an important lever for change to tackle pressing sustainability issues. In this paper, 'sufficiency' is proposed as a driver of business model innovation for sustainability. Sufficiency-driven business models seek to moderate overall resource consumption by curbing demand through education and consumer engagement, making products that last longer and avoiding built-in obsolescence, focusing on satisfying 'needs' rather than promoting 'wants' and fast-fashion, conscious sales and marketing techniques, new revenue models, or innovative technology solutions. This paper uses a case study approach to investigate how companies might use sufficiency as a driver for innovation and asserts that there can be a good business case for sufficiency. Business models of exemplar cases are analysed and insights are gained that will contribute to future research, policy makers and businesses interested in exploring sufficiency.

1. Background: the need for sufficiency-driven business models

Pressure on natural resources and a growing global population and middle class are creating increasing sustainability challenges for industry and society. It is increasingly apparent that business-

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as-usual is not an option for a sustainable future: a fundamental shift in the purpose of business and almost every aspect of how it is conducted is required (Jackson, 2009; Ehrenfeld and Hoffman, 2013; Bocken et al., 2014).

Current approaches to sustainability, focusing largely on efficiency and productivity improvements and 'greening' supply chains and products are an important first step in reducing the impacts of production and consumption. However, growth in demand is far outpacing such improvements and innovations and these initiatives can facilitate rebound-effects where efficiency gains lead to more consumption (Druckman et al., 2011; Bocken et al., 2014). More recently, the concept of the 'circular economy' has gained widespread popularity, whereby materials are continually recycled and reused to curtail demand for new materials. However, even this approach can lead to greater resource consumption if total final consumption of products and services is not mitigated (Allwood, 2014). Referring to Boulding (1966), a successful circular economy could only be achieved if global demand for the volume of products stabilised, which is a utopian prospect in our growth-driven economic system and expanding global population (in Allwood, 2014).

Accordingly, a growing number of academics argue that current industrial sustainability initiatives that focus on the supply-side (e.g. product design, production, and supply chain initiatives) are inadequate on their own and that action is needed to directly tackle excessive consumption levels (e.g. Jackson, 2009; Ehrenfeld and Hoffman, 2013). Such initiatives are often referred to as 'sustainable consumption' (e.g. Jackson, 2009). According to The Royal Society (2012) the most obvious way to reduce the negative effects of human activity on the planet is to decrease resource consumption of those who currently consume the most. While a large part of the world still needs further development and needs to increase consumption to alleviate poverty and suffering, the developed world increasingly experiences the negative effects of over-consumption, such as worryingly high obesity rates and other related health issues. Moreover, whereas most consumption takes place in developed countries, the poorest are most directly affected by climate change impacts (IPCC, 2014) and the environmental degradation caused by materials extraction and production. Therefore tackling developed world consumption levels offers benefits to all.

To manage consumption, businesses will need to move beyond eco-efficiency (saving energy and materials), which is close to the conventional business case, to include more radical new approaches such as 'sufficiency', which focus on reducing absolute demand by influencing and mitigating consumption behaviour (Dyllick and Hockerts, 2002; Young and Tilley, 2006; Bocken et al., 2014). As Ehrenfeld (2000, p. 204) observes: 'The challenge to industrial societies is not simply to reduce consumption, but to transform the nature of what we consume so that both human beings and natural systems can prosper'. 'Efficiency' in industrial sustainability is generally 'supply-side' or production-focused, aimed at moderating production inputs of materials, energy and labour. Green products and supply chains equally focus on moderating production inputs and impacts: that is, doing the same or more with less. In contrast, we conceptualise 'sufficiency' in industrial sustainability as primarily demand-side or consumption-focused, aimed at moderating end-user consumption: *encouraging consumers to make do with less*. 'Sufficiency', according to the Oxford English Dictionary, is the 'condition or quality of being adequate or sufficient; an adequate amount of something, especially of something essential'. The opposite of sufficiency is manifested in our current developed world consumption patterns – ever more rapid discarding and replacement of products and materials, and in the case of food, over-consumption reaching endemic proportions in some countries. Political, social and economic systems champion and celebrate consumption-based economic growth (Jackson, 2009), which inevitably leads to over-consumption after basic needs have been satisfied. A fundamental shift from over-consumption towards a more sufficiency-orientated view of consumption and production, or what has been described as a 'sufficiency economy' (Thailand Foreign Office, The Government Public Relations Department, 2014) is therefore essential.

A sufficiency-based approach takes an alternative direction to doing business – directly seeking to reduce or moderate consumption. This notion was articulated in 2006 by the Sustainable Consumption Roundtable (2006, p. 62): "The long-term goal of sustainable consumption must surely be: societal aspirations that are fair for everyone; business models which add human value without taking away environmental value; an economy which is stable and yet sustainable." Sufficiency in this context is a more 'social' principle; referring to individuals (and companies) living on needs rather than wants

(Young and Tilley, 2006, p. 409). Sufficiency-driven business models focus on influencing consumption behaviour, which involves for example, a fundamental shift in promotion and sales tactics (e.g. no aggressive or manipulative 'over-selling'), eschewing fast fashion trends, providing consumer education and 'choice editing' to reduce access to sustainably undesirable products, and product design changes to enhance durability, reparability and longevity (Bocken et al., 2014).

At first glance, such approaches seem very much at odds with current business practices and perhaps unviable in competitive markets where sales growth is a key to success. Others argue that it is not the place of business or politicians to interfere in consumer decisions, and hypothesise that sufficiency can only be effectively driven by consumers themselves though product boycotts or consumer activism (e.g. Dyllick and Hockerts, 2002). Notwithstanding these concerns, some examples of sufficiency-based business are emerging. However, despite the interest and growing awareness of the need for a sufficiency-based approach, there is still little understanding of how business and industrial policy might align with this need across the full range of industry sectors and there are few documented examples of such sufficiency-based businesses to date. The literature identifies successful demand-side management to tackle consumption levels in the energy sector through ESCOs (Energy Service Companies), but this is limited to one industry sector with a very specific and acute set of challenges to address driven by legislation, inertia and costs associated with constructing new power plants. According to FORA (2010) ESCOs are business models where the provider "optimizes companies and public buildings and in return gets paid by part of the savings achieved. The customer does not have to pay up front [and is] compensated if savings are less than guaranteed" (p. 9).

This paper explores to what extent business might take a more prominent and leading role in moving towards a sufficiency-driven economy across a broader range of industry sectors, and what business models might be suitable to create and sustain such an economy. Based on our definition of sufficiency-based business (focusing on demand-side moderation), this paper identifies and presents a range of novel emergent cases in key consumer sectors. These business cases suggest that profitability and consumer acceptance of business-led sufficiency approaches is possible, through premium pricing, generating customer loyalty, and increased market share from better (e.g. more durable) products. Such business models can therefore be economically viable, while contributing to reducing over-consumption, and hence material and energy throughputs. The research question is: *How can sufficiency serve as a driver for sustainable business model innovation in companies?*

This paper explores the potential of sufficiency-driven business models using a case study approach to investigate the extent to which such approaches are possible and how they might be designed and maintained. The business models of the companies are analysed to identify the key characteristics and drivers of sufficiency-based solutions. First, the literature on sufficiency in a business (model) context is reviewed. In the methodology section, the case study companies and research approach are introduced. In the case study section, characteristics and types of sufficiency-based business models are developed based on the cases. The discussion section includes recommendations for businesses and is followed by a short conclusion of the main findings of this paper.

2. Literature review

The literature review explores what sufficiency-driven business models might look like. Reference is made to existing sufficiency perspectives (e.g. Dyllick and Hockerts, 2002; Bocken et al., 2014) and the waste hierarchy (Price and Joseph, 2000) as a well-established framework to evaluate the environmental preference of a range of options.

2.1. Perspectives on sufficiency

Sufficiency is not widespread as a driver for business model innovation, perhaps because of its seemingly paradoxical characteristic of seeking to mitigate consumption in a consumption-driven economy. However, sufficiency has been described as a country vision (UNEP, 2014), a corporate sustainability tactic and a consumption issue (Dyllick and Hockerts, 2002).

On a country level, sufficiency has been popularised by Thailand's King Bhumibol Adulyadej, who in his in his royal addresses focused on "*sufficiency, moderation, economizing, rationalization, and the*

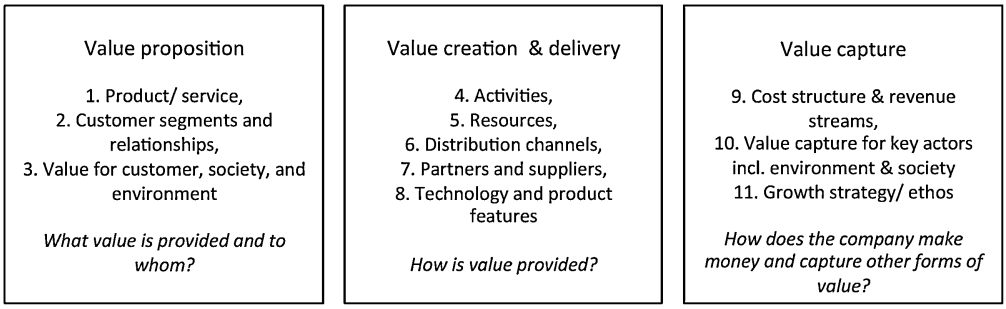


Fig. 1. SBM framework.

Source: Adapted from Short et al. (2014).

creation of "social immunity" for the majority of the people who are in the farm sector" (Thailand Foreign Office, The Government Public Relations Department, 2014). *[The King] cautioned the Thais not to be imprudent in conducting their lives, but to be fully aware of the development process in accordance with proper theories, and within the framework of good morality. This has become known as "Sufficiency Economy."* (Thailand Foreign Office, The Government Public Relations Department, 2014). The Sufficiency Economy is included in government projects and aims to enable the community to maintain an adequate population size and preserve the wealth of ecosystems (UNEP, 2014).

Sufficiency has been described as a corporate sustainability strategy. Sufficiency, as described in Dyllick and Hockerts (2002) and Young and Tilley (2006), refers to the actions of individual consumers to make responsible choices, right through to consumers collectively boycotting or subverting corporate branding and marketing strategies that are believed to be environmentally harmful. This positions sufficiency as largely a *consumer issue* rather than a firm's. However, the scope of sufficiency, which has close ties with 'sustainable consumption' that is about fulfilling our potential, while living within our means (Sustainable Consumption Roundtable, 2006), is potentially much broader.

This paper hypothesises that there can be a good business case for sufficiency that can be pursued by companies, rather than merely relying on a reactive approach that deals with consumer boycotts or policy intervention on an ad hoc basis. Building on earlier work (Bocken et al., 2014), 'encourage sufficiency' may therefore become a key business model innovation for sustainability, where "sufficiency" can be viewed as an opportunity rather than a hindrance to innovation or business success. Novel business models building on sufficiency principles – limit overconsumption and associated unnecessary resource use – are required. Companies, because of their marketing and branding knowledge, can use this knowledge positively and adapt their promotional strategies to focus on sustainable consumption (Bocken and Allwood, 2012).

2.2. Three frameworks to assess business model sufficiency

Three frameworks are introduced: the sustainable business model (SBM) framework, the strategies for corporate sustainability, and the waste hierarchy. A business model lens is used to analyse the cases in this paper to draw out recommendations for future sufficiency-based businesses.

2.2.1. The sustainable business model (SBM) framework

Business model innovation lies at the core of changing the way business is done (Magretta, 2002). Business models define the way a firm does business and include the following elements: value proposition (product service offering), value creation and delivery (e.g. activities, resources, suppliers, partners) and value capture (cost and revenue streams) (Fig. 1). Business model innovation for sustainability seeks to create significant positive benefits or significantly reduce negative impacts for the environment and society; through changes in the way the organisation and its value-network create, deliver and capture value (Bocken et al., 2014). Such business models may be viewed as an important lever for change (Schaltegger et al., 2012; Bocken et al., 2013). Bocken et al. (2014) have proposed a

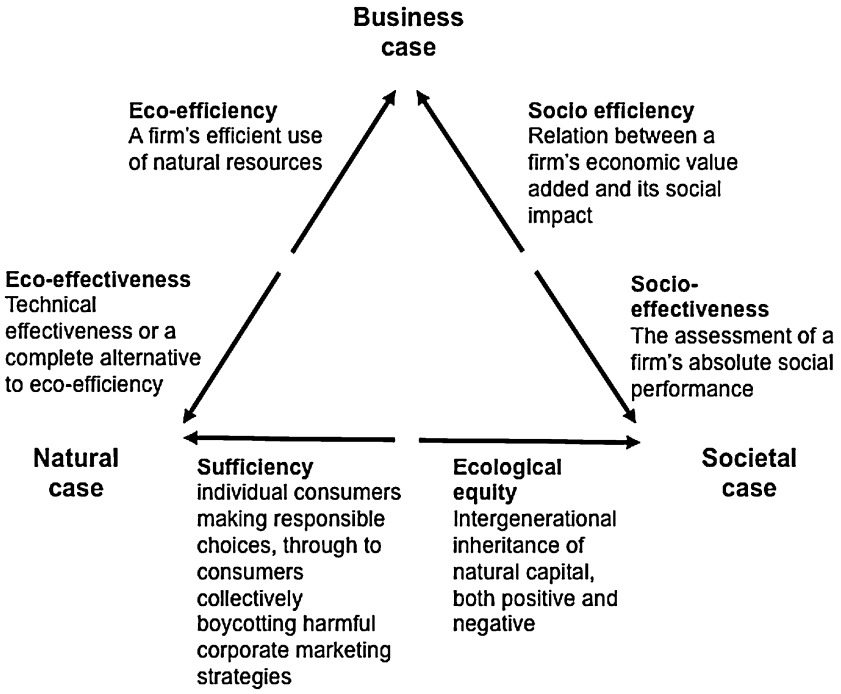


Fig. 2. Six strategies for corporate sustainability.
Sources: The six strategies framework was developed by Dyllick and Hockerts (2002); definitions were included from Young and Tilley (2006).

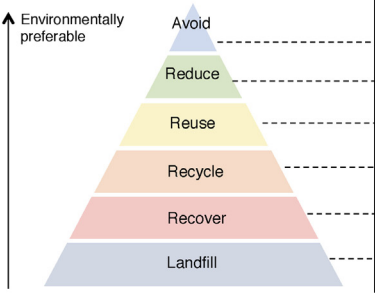
categorisation of SBM archetypes to assist firms in expanding the scope and understanding of business model innovations in practice and research for sustainability. These include:

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 and environment.
8. Develop scale-up solutions.

These archetypes can be applied as stand-alone initiatives or in combination to build up the business model for sustainability. The archetype "Encourage sufficiency" focuses specifically on demand-management and mitigating consumption.

2.2.2. The strategies for corporate sustainability

Few authors have described 'sufficiency' as a business strategy to date. Dyllick and Hockerts (2002) developed a framework of six sustainability strategies, specifically including sufficiency (Fig. 2). Dyllick and Hockerts (2002) offer the hypothesis that at the operational level, each of these strategies would need to be accounted for separately, whereas at the strategic level these dimensions should be considered holistically. Similarly, Bocken et al. (2014) argue that multiple sustainable business model archetypes may need to be combined within one business to have the greatest impact on corporate sustainability. According to Young and Tilley (2006) more work needs to be done on how companies



Business model innovation	Example
Avoid overconsumption, avoid planned obsolescence	Patagonia "Don't buy this jacket advertisement" encouraging customers to think before they consume (Chouinard & Stanley, 2012)
Reduce material/ resource use	Lightweighting of aluminium drink cans.
Reuse products over time or across multiple people	Car sharing schemes (reuse across multiple people), Second hand and vintage markets (reuse over time)
Make use of recycled materials	Aluminium industry focusing on continuous recycling of aluminium (Wells & Seitz, 2005)
Recover - Create value from 'waste'	Industrial Symbiosis – for instance creating new product lines from waste (Short et al., 2014); Anaerobic digestion
Source landfilled or otherwise discarded raw materials	Healthy Seas initiative – sourcing fishing nets from sea to be used as a raw material to carpets (healthyseas.org)

Fig. 3. Waste hierarchy and potential business model innovations.
Source: Developed from Price and Joseph (2000) and Papargyropoulou et al. (2014).

fit into this model, and more importantly, on the practices that are transferable to other companies. As shown in Fig. 2, Dyllick and Hockerts (2002) perceive a sufficiency strategy as primarily reactive, driven by consumer choices and consumer and societal pressure. In contrast, in this paper 'sufficiency', a moderation in resource consumption, is conceived as an effective core strategy for sustainable business model innovation, initiated and driven by companies themselves, rather than merely a reactive strategy to an external influencing factor on business. As Dyllick and Hockerts (2002) present a somewhat different conceptualisation of a 'sufficiency' strategy, it was decided not to use this framework to analyse the cases.

2.2.3. The waste hierarchy and sufficiency

To demonstrate how 'sufficiency' may serve as a viable corporate strategy that makes business (economic) sense and mitigates environmental impact (Bocken et al., 2014), examples of 'sufficiency' are presented based on the waste hierarchy (Fig. 3). Fig. 3 presents a business model orientated interpretation of the waste hierarchy and examples against each level of the waste hierarchy.

The most impactful option for companies to pursue is 'avoid'. That is, to assist or encourage consumers to avoid over-consumption through the way they do business. There are also opportunities at the lower levels of the waste hierarchy as well: for example, at the stage of landfilling, some companies have managed to use discarded materials as a raw material input for new products.

2.3. Defining 'sufficiency-based business models'

Building on the literature, sufficiency-based business models deliver sustainability by reducing absolute material throughput and energy consumption associated with provision of goods and services by moderating end-user consumption: encouraging consumers to make do with less. As such, sufficiency is embodied in the three environmentally most preferable options of the waste hierarchy: avoid, reduce and reuse. The definition of sufficiency-driven business model innovation builds on Dyllick and Hockerts (2002) and Young and Tilley (2006) who emphasise the role of the consumer in making responsible choices (e.g. buying ethical products) and Bocken et al. (2014) who emphasise the business-side of sufficiency, focused on durable design and product life extension (e.g. second hand markets), frugal innovation (back to the fundamentals), conscious sales (against 'fast fashion'), and moderating consumption. Sufficiency-driven business model innovation is therefore about curbing consumption as part of the business model by moderating demand through education and consumer engagement, making products that last and avoiding built-in obsolescence; extending product lives to slow disposal and replacement, focusing on satisfying 'needs' rather than promoting wants' and fast-fashion, and reducing overall resource consumption through conscious changes in sales and marketing techniques, new revenue models, and innovative technology solutions.

As an ideal sustainability solution a sufficiency-driven business model would also require sustainable production methods and supply chains, and that revenues and benefits to be fairly distributed

Table 1
Interviews for case studies.

	Case company	Waste hierarchy	Size/maturity	Interview with	Interviews on
1	Vitsœ – furniture manufacturer	Avoid, reduce, reuse	Large	MD	November 2011 (face to face + visit to facilities), March 2012 (phone), June 2014 (email exchange)
2	Brunello Cucinelli – clothing manufacturer	Avoid/reduce	Large	Personal assistant to CEO	November 2012 (face to face + visit to facilities, and additional communication material)
3	Patagonia – outdoor sports gear manufacturer	Avoid, reduce, reuse	Large	Head of Patagonia Philosophy	September 2013 (face to face) June 2014 (phone and email)
4	Kyocera – document management system manufacturer	Avoid, reduce, reuse	Large	CSR Director	July 2012 (face to face + visit to offices)
5	Riversimple – automotive manufacturer and car lease service	Avoid, reduce, reuse	SME start-up	Co-founder	October 2012 (face to face) June 2014 (face to face and email)
6	Reduse – equipment ('unprinter') manufacturer	Avoid, reuse	SME start-up	Co-founder/CEO	July 2014 (face to face and email)

across (all) stakeholders throughout the supply chain, including benefits for 'society' and 'environment' (Boons et al., 2013; Boons and Lüdeke-Freund, 2013; Bocken et al., 2013, 2014).

3. Method

To further conceptualise 'sufficiency-driven business models' a case-based approach is taken, as case study research is suited to obtain a holistic, real-world perspective and is suited to address 'how' and 'why' questions focusing on contemporary events (Yin, 2014). Furthermore, this work is exploratory because to date, little research has been done in this field. The cases were selected based on reviewing a large range of company cases gathered and reviewed in Bocken et al. (2014) and investigating which types of businesses exemplified the 'sufficiency' theme.

The criteria to select the cases included: the company appears to have taken a leadership view on 'sufficiency' as part of the business model, and is focusing on the higher levels of the waste hierarchy (primarily avoid, reduce and reuse) (see Table 1). A practical consideration was data availability and access to the organisation.

None of the cases is a perfect example of 'sufficiency' and limitations or even contradictions are evident, but all demonstrate some important approaches to moderating consumer demand. Consumers also have a role to play in pursuing sufficiency in their daily lives, so responsibility cannot lie solely with companies (or, more broadly, governmental bodies). This is in line with the Thailand view on sufficiency urging every citizen to live a modest life (Thailand Foreign Office, The Government Public Relations Department, 2014). Nevertheless, we aim to highlight the sufficiency themes within each of the cases and identify how firms might more broadly adopt such approaches. It should also be noted that the cases as presented largely focus on sales and customer relations and not the entire product life cycle.

Interviews with key personnel of the businesses were complemented with review of websites, annual reports, and other public documents to build the case studies. The case studies explored the following themes:

- How the company conceived its own business model.
- The way 'sufficiency' is engendered through its business model.

- How the company aims to grow or expand.
- Opportunities and barriers or challenges to establishing a sufficiency driven business model.
- Key characteristics of the firm, enablers and drivers for sufficiency initiatives.

The case companies are shown in Table 1. The case narratives in the next section are based on material obtained during the interviews and background material (websites and corporate documents).

4. Case studies

This section describes the six case studies.

4.1. Vitsœ – extending product life and encouraging reuse

Vitsœ is a furniture manufacturer supplying shelving and storage solutions to small business and private customers. The company was founded in 1959 and currently employs around 50 people. Its vision is to manufacture furniture to last as long as possible, that is adaptable and discreet, by producing products that are durable, easily extendable, reparable and avoid 'planned obsolescence' (Adams, 2012; Fablemaze Weather, 2014). A key feature of Vitsœ's sufficiency strategy consists of a deliberate policy of under-selling, building trust and long-term relationships with customers (Adams, 2012). Vitsœ purposely trains sales staff to under-sell rather than over-sell on the basis that customers can always add more at a later stage if needed. There are no sales commissions paid to staff, or discounts offered to customers (e.g. no bulk purchasing discount or end of season sales) and installation and support services associated with future relocation of furniture (incl. repair) are provided at cost price (Adams, 2012). These business model features help to ensure unnecessary sales and consumption and waste are kept to a minimum. Their sales strategy is focused on loyal customers – their customers are viewed as the main ambassadors for the product. Vitsœ only does direct sales through its physical shops, online or phone to keep the personal contact with the customer and control over how sales are done. The sales strategy implies a potential sacrificing of short-term opportunistic growth for the business, which is in stark contrast to most conventional business thinking. Trust and reputation developed through the customer relationship creates positive word-of-mouth recommendations that drive future sales to new customers and ensures the ongoing business viability. Although public data on Vitsœ's sales are not available, Evans et al. (2009) found that since 1995, when Vitsœ moved the company to the UK sales have risen year on year by 20%. Hence, the business has been financially viable despite its unconventional sales strategy.

4.1.1. Sufficiency-related elements in Vitsœ's business model

Vitsœ exemplifies 'sufficiency' by actively striving to eliminate built-in obsolescence through its design and production systems, and consciously eschewing short-lived fashion cycles or trends. By going against the industry norm of designing and manufacturing products (deliberately intended to have a limited useful life) Vitsœ avoids the cycle of replacement and repurchasing. They are consciously under-selling products by training sales staff to offer customers the minimum they need for the job, and measuring performance on a broader range of customer satisfaction rather than sales figures. Various services are offered at a nominal cost to encourage customers to reuse rather than discard products. Finally, Vitsœ does not trade shares publicly because the owner feels demands of external shareholders could compromise the company's vision.

4.2. Brunello Cucinelli – timeless quality clothing

Cucinelli is an Italian fashion house operating in the luxury apparel sector, owned and run by the founder, CEO and head designer, Brunello Cucinelli. The company was established in 1978 specialising in cashmere sweaters, and has expanded to become a globally recognised brand producing 'sport luxury chic' menswear, womenswear, and leather goods. Cucinelli employs about 700 people globally, with its headquarters and factory in the Umbria region of Italy.

The business model is based on premium pricing, offering customers exclusive products hand-made in Italy. There is high tangible value in the products based on Italian design and highest quality fabrics, combined with a story of social value creation and ethical production based on Italian local manufacturing and community development. According to the interviewee, while not all customers engage with the social dimension, those that do perceive this as an important part of the value proposition.

Cucinelli was recently floated on the Italian stock market in order to provide liquidity for the family members. The interviewee explained that the CEO made social value creation a key theme in the investor briefings for the Initial Public Offering, along with issuing specific guidance to potential investors that embodied a sufficiency ethos: the company would not pursue aggressive leveraged growth and would not entertain suggestions to outsource to lower-cost regions to increase profit.

4.2.1. Sufficiency-related elements in Cucinelli's business model

The main sufficiency theme for Cucinelli is the focus on products that are of the highest quality and, unlike many other fashion houses, designs aim to be timeless without brand logos and use natural colours and fabrics that can continue to be (re-) used. A second distinguishing feature emphasised during the interview is that from the outset the founder conceived the business purpose as contributing to society and creating dignified work in the region, rather than seeking to maximise economic wealth creation, profit or growth. Cucinelli's social initiatives have sought to create local skilled employment, and demonstrate a concern for employee and supply chain well-being. All their garment producers and almost all fabrics suppliers are Italian, with 80% of these based locally in the Umbria region, which contrasts starkly with the outsourcing to sweatshops in low-cost regions that is commonplace in the industry.

Luxury goods may appear to be diametrically opposed to sufficiency, and some are; however, they can be the more sustainable option if they are cherished, last longer and are used more, rather than quickly going out of fashion, failing prematurely and being discarded. Moreover, quality should not be confused with quantity – expensive (luxury) does not necessarily imply more material or energy are embodied in the product, but as in this case, the premium price reflects the design and manufacturing choices – artisanal production, 100% inspection, and the highest grade natural materials – creating high social and customer value with relatively low environmental impact.

4.3. Patagonia – encouraging reuse and repair of clothing

Patagonia originally started as a mountaineering equipment company in the 1950s. The outdoor clothing business was established in the 1970s as a profitable business line to diversify the business (Chouinard & Stanley, 2012). The company has become recognised as a leading industry innovator through its environmental and social initiatives, and the brand is now considered synonymous with conscious business and high-quality outdoor wear. Patagonia has long supported activist groups to pursue their environmental causes and has worked to integrate sustainability initiatives throughout their business. Advertisements augment these initiatives to create environmental awareness among their consumers (Chouinard, 2006; Chouinard and Stanley, 2012).

In their 'Common Threads Initiative' initiated by eBay and Patagonia (eBay, 2015) Patagonia pledges to 'build useful things that last, to repair what breaks and recycle what comes to the end of its useful life', whereas customers are asked to pledge to only buy what is needed and will last, make repairs and reuse and recycle anything else and consider second hand products. Working with eBay they established a store-front to support and encourage a reuse market for second-hand Patagonia clothing. Additionally, a repair website in collaboration with iFixit teaches customers how to repair their gear (iFixit, 2015).

In a one-off advertisement in the New York Times, Patagonia asked its customers to "Not Buy" their jackets, trying to create awareness of their purchases and encouraging them to make things last. Labels sown into every garment provide a further reminder to customers to think twice before purchasing. Conventional marketers may criticise the approach as a gimmick to increase sales, and indeed, according to Vincent Stanley (Director, Patagonia Philosophy), overall sales in Patagonia did rise a little, whereas the sales of this particular jacket stayed the same. Dumaine (2012) observed that

Patagonia has annual sales of around $400 million and "makes money even while encouraging its customers to consume less".

4.3.1. Sufficiency-related elements in Patagonia's business model

Patagonia's main 'sufficiency' strategy consists of encouraging consumers to think twice before making premature replacements, or over-consuming. Patagonia through its partnerships with iFixit and eBay aims to make it easy for customers to either repair products to increase the useful life of products, or resell the products when they no longer want them through an established and credible second-hand marketplace. These initiatives are supplemented through high-profile marketing campaigns ("don't buy this jacket"), and labels placed inside every garment reminding customers to repair and reuse rather than buy new. Finally, Patagonia is structured as a benefit corporation (B Lab, 2015) allowing the company to align its corporate structure with its business model to create societal and environmental benefits through the way business is done.

4.4. Kyocera – managing demand for printing and copying

Kyocera is a Japanese technical ceramics company with worldwide operations employing 60,000 employees. Kyocera's corporate philosophy is to try to introduce environmentally preferable solutions to existing technology and develop new technologies that are intrinsically environmentally and socially responsible.

The case study focused on their office copier business (UK sales and marketing subsidiary). The established industry business model consists of selling printers and copiers relatively cheaply (sometimes below cost), and then making high profits through repeat sales of high-margin toner cartridges. To perpetuate the business model the manufacturers have introduced complex cartridges that incorporate the print drum, developer and fuser unit; all essential components of the print engine. These cartridges are often too complex to disassemble and invariably end up in landfill. Hence, this business model is intrinsically unsustainable. According to the CSR Director at the time, Kyocera has deliberately adopted a different route, developing a durable print drum, developer and fuser, permanently sited in the machine, and using consumables, which are simple plastic reservoirs, containing only toner and being easily recyclable. Kyocera's model offers ongoing substantial through-life reductions in operating costs and waste to landfill.

Most printer and copier manufacturers now design in features to help reduce paper and energy consumption, such as double-sided printing and multiple pages per sheet. During the interview, it emerged that Kyocera have identified behavioural change as a key to ensuring these features translate into environmental benefits. They are working with their customers by offering a holistic product-service solution including paper management consultation, system redesign, and real time monitoring. To facilitate this new business model, Kyocera have developed software and services for which they can charge a fee to the customer. The overall savings are claimed to justify service costs for the customer and reduce demand for new printers, while the services represent an important new business line for Kyocera.

4.4.1. Sufficiency-related elements in Kyocera's business model

For Kyocera, sufficiency is embodied in their print and copy management services that seek to help the customer reduce demand for printing and copying even though this will ultimately reduce demand for Kyocera's printer and copier machines. Management services include raising awareness of the need to reduce printing through presentations, print-release function, monitoring usage, default setting for double-sided printing, and so on. The company is aware that this might undermine their existing manufacturing business, but aims to offset this with increasing services provision.

4.5. Riversimple – reducing impacts of automotive solutions

Riversimple has developed a hydrogen fuel cell powered urban vehicle suited for two people. One of its founders, Hugo Spowers, observed that most cars are used to drive around one or maybe two people at a time and are used only rarely at full capacity. Furthermore, most cars are used for short distances,

for example in cities where the top speed would be relatively low. This means that most cars at present are over-specified and over-designed. The Riversimple car will be a 2-seat hatchback with a top speed of 55 mph and a vehicle range of 200 miles (Riversimple, 2015). It will be light (approximately 350 kg), and by combining fuel-cell technology with an energy regeneration braking system could deliver high levels of fuel efficiency.

The technology solution is augmented with a full-service solution for the customer, whereby the customer pays a monthly all-inclusive fee for usage, where the running costs including fuel and maintenance are the responsibility of Riversimple. The service provision solution enables consumers to access what might otherwise seem expensive unproven technology. Moreover, by delivering functionality, rather than ownership, the business model seeks to encourage the right behaviours by better aligning sustainability interests between the environment, the customer and the company directly through the business model. Riversimple is a start-up, so it is hard to forecast its future financial viability at this stage.

4.5.1. Sufficiency-related elements in Riversimple's business model

Sufficiency is embedded through the holistic design of the business model across all aspects of the business to optimise for social and environmental sustainability in the provision of personal mobility with the objective 'to systematically pursue the elimination of environmental impact of personal transport'. Riversimple's business model seeks to break down some of the existing concepts of car ownership; removing the fashion element of new models, reducing associations of prestige and status, focusing on the core of providing personal mobility. In so doing, the demand for continuous upgrade and replacement is addressed, potentially radically reducing production demand and car usage. Finally, Riversimple's innovative corporate structure seeks to involve representatives of their key stakeholder groups (including "Environment" and "Community) to ensure value is created beyond the business, its investors and customers (Riversimple, 2015).

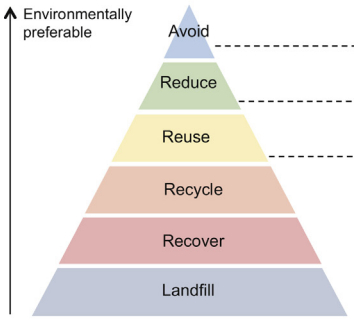
4.6. Reduse – unprinting

Reduse (a combination of 'reduce and reuse'), a spin-off from the University of Cambridge, has developed a technology to remove print from paper, which they refer to as 'unprinting'. It is an early stage innovation to remove toner print from printed paper using lasers, potentially enabling the paper to be reused many times over. The company wants to demonstrate that 'reuse' is the new recycle, and that merely recycling is a defeat. The primary focus is on offices with a typically high paper use (e.g. law firms, banks, universities). Potential rebound effects of unprinting could be mitigated, by combining this with a document management service (see Kyocera's case).

Reduse wants to help companies save money and provide an environmentally superior (i.e. less waste, energy, water, chemicals, CO_2) alternative to recycling paper. As such, the unprinter may be viewed is a potential educational tool as well as a cost saving and environmental impact-mitigating device. The ambition of Reduse is ultimately to see 'an unprinter for every printer' (Reduse, 2015). In the long-term, if collaboration with an existing printer manufacturer is established, Reduse can embed its technology into existing office equipment. Reduse is an early stage venture, which is still in the R&D phase; so a clear view on its financial viability is not yet available.

4.6.1. Sufficiency-related elements in Reduse's business model

The main sufficiency dimension of this business model is that the technology was developed from the outset to tackle paper consumption through a combination of 'reuse and reduce'. The 'unprinting technology' allows customers to reuse paper over and over to potentially radically reduce total paper consumption. Reduse aims to transform the way paper is used by their new technology and through educating customers. It should be noted that Reduse's model is focusing on products and services and not at entire product-life cycles (e.g. it does not at the time of writing focus on improved forms of paper). However, it has the ambition to support absolute reductions in paper consumption through reuse and education. Whereas some might argue that Reduse is about 'eco-efficiency', the case is added as a 'sufficiency' example because of the ambition to reduce absolute paper consumption through the business.



Business model innovation linked to waste hierarchy	Examples from cases
Avoid overconsumption, avoid planned obsolescence	Patagonia "Don't buy this jacket", Vitsœ "Against Obsolescence", Cucinelli premium model, Reduse avoiding new paper production, Kyocera durable printers and document management systems, Riversimple avoiding new car production
Reduce material or resource consumption	Reduse total paper use reduction, Riversimple 350 kg car
Reuse products over time or across multiple people	Vitsœ 'moving service', Riversimple car sharing (reuse across multiple people), Patagonia – Ebay second hand market and repair service, Reduse paper reuse, Kyocera reusable cartridges

Fig. 4. Business model options for sufficiency building on cases and waste hierarchy.

4.7. Summary of the case studies

This section collates the findings from the six cases to develop the foundations of a sufficiency-driven sustainable business model. The summary of the cases is shown in Tables 2 and 3. In brackets, the sources for the cases (interview, public data and websites or corporate documents) are shown (Table 2). Table 3 shows that the case companies are taking a holistic approach to industrial sustainability, where 'sufficiency' is one of several business model innovations applied.

The company visions in each of the cases generally show a mature view on 'sustainability'; sustainability is a core part of the way business is done and a source of competitive advantage. The case companies through their business models challenge the way conventional business is done. The aims of the companies move beyond the company boundaries, to creating a wider understanding for consumers on how to best live and act.

The *value proposition* of the case companies focuses on the environmentally preferable options on the waste hierarchy – avoid, reduce and reuse (Fig. 4). Durability, reparability and modular design are key design criteria employed by the case companies to '*avoid*' waste and resource use. Whereas Reduse seeks to *reduce* the number of trees being cut for paper usage, Riversimple has created a light car that reduces material and energy use. *Reuse* of products across markets (from first to second-hand) and generations is pursued by Cucinelli, Vitsœ and Patagonia in particular. After use by one customer, it will be passed on to another 'customer' for free or at a discount from the original price (except, for instance, collector items). Companies such as eBay might facilitate this (e.g. Patagonia's Common Threads Initiative). Finally, product-sharing platforms are emerging to facilitate reuse of the same product across multiple customers, Riversimple being an example of this. This strategy 'avoids' and 'reduces' resource use.

Value creation and delivery in all cases involves a close relationship with the value-chain to ensure quality, consistency and continuous improvement while minimising environmental impact (e.g. waste). This is illustrated in particular through the cases of Vitsœ, Patagonia, Cucinelli and Kyocera. Sales and marketing strategies include environmentally conscious selling, and the companies utilise marketing and advertising and sometimes the product itself (in the case of Reduse, the Unprinter) as an educational tool. The employee recruitment and training policy is strongly focused on maintaining the company's sustainability ethos. Finally, capturing value is not about maximising economic wealth for the companies: Patagonia, Cucinelli and Vitsœ restrict growth to rates that allows the firm's resources and relationships to scale without loss of integrity. Patagonia is structured as a benefit corporation (B Lab, 2015), whereas Vitsœ is a limited company. These company structures could avoid loss of control over the mission and vision.

Table 2
Summary of the cases building on the business model framework as presented in Fig. 2. Note (i) B2B, business-to-business; B2C, business-to-consumer. Note (ii) Data retrieved from: 1. Case interviews; 2. Public material/company websites; 3. Corporate documents.

	Vitsœ	Cucinelli	Patagonia	Kyocera	Riversimple	Reduse
Business model strategy for sufficiency	Premium pricing model (1, 2, 3)	Premium pricing model (1, 2)	Premium pricing model (1, 2)	Technology-based solution, service-based offering (1)	Service provision with technological innovation (1, 2)	Technology-based solution (1, 2)
Sustainable business model elements						
Value proposition						
1. Product/service/value for customer	High end, timeless, durable furniture with high service levels (1, 2)	High end, timeless, durable craftsmanship in clothing design (1, 2, 3)	High end, durable, multi-functional outdoor gear, high service (1, 2)	Reusable ink cartridges, high quality printers and high levels of service, document management services (1)	Convenient and green access to personal transport (1)	Reuse paper, save cost and the environment. Education tool: reuse is the new recycle (1, 2)
2. Customers/ segments/ relations/service	High-end and B2B (1, 2)	High-end individual customers (1)	High end + second hand market for new segments (1)	High-end and environmentally conscious businesses (1, 2)	Mid-range consumers. Servicing done by Riversimple (1)	B2B, starting with large paper users, afterwards moving to B2C (1)
3. Value (proposition) for environment/society	Going against planned obsolescence (1; Fablemaze Weather, 2014; Adams, 2012)	Social value creation in the community, ethical sourcing and longer product life (1)	Creating awareness of, and supporting reuse and repair (1, 2)	Innovations for reduced resource use (e.g. paper, cartridges) (1)	"Green" personal mobility substitutes traditional cars with 'greener' solution (hydrogen, smaller, optimised usage) (1)	Reuse rather than recycling of paper to reduce virgin paper use (1, 2)
Value creation & delivery						
4. Key activities (process, R&D, sales model)	Under, rather than oversell – customers can add more if needed. Moving & installation service (1)	Local highly skilled employment, concern for employee and supply chain wellbeing (1)	Conscious sales (environmental impact, repair) (1)	Product-service offering to reduce paper consumption; remanufacture and reuse cartridges (1)	Reduce new car sales and increase 'green' car usage (1)	Promotion: cost saving and 'green feel'. Educational element: 'reuse is the new recycle' (1)
5. Key resources (materials, infrastructure, human resources (*most salient elements are mentioned for the cases*)	Strict hiring policy focused on 'Vitsœ ethos' (1). Sustainability = common sense (Adams, 2012)	Social value creation driven by the owner; strong attraction for employees (1)	Hiring policy focused on 'Patagonia Philosophy' (1)	'Kyocera way' corporate ethos and recruitment	Hiring based on Riversimple ethos. Need for development of infrastructure and hydrogen technology (1)	Develop a commercially viable prototype is where most resources are being allocated (1)
6. Distribution channels	Showrooms showcasing products. Direct delivery to customer. Relocation and installation service (1)	Exclusive catalogues and retail stores. Limited advertising strategy (1, 2, 3)	Repair services, second hand sales. Select number of retailers, catalogue with advocacy (1; Chouinard and Stanley, 2012)	Customer education. Challenge: engaging distributors with sustainability (1)	High access to 'green transport' in urban areas (1)	Existing sales channels for printers will be used for unprinters (1)
7. Suppliers/ partners/ coalitions	Close cooperation with suppliers to improve durability. Reusable packaging for deliveries (1)	Garment manufacturers are paid above average. 80% regional suppliers (1)	Sourcing based on sustainability and durability (1; Chouinard and Stanley, 2012); eBay is partner in Common Threads Initiative	Kyocera's customers are key suppliers as they return empty packaging for remanufacturing (1)	Suppliers selected to fulfil new functions (hydrogen, lightweight). Collaborations with localities to align with existing infrastructure (1)	Initially, collaborations with large companies and traditional printer/copier sales channels (1)

Table 2 (*Continued*)

	Vitsœ	Cucinelli	Patagonia	Kyocera	Riversimple	Reduse
8. Key sufficiency-enabling technologies and process/product features	Simplicity in design, durability, continuous improvements without harming compatibility (1, 2)	High quality materials and manufacturing processes (1, 2)	Sustainable design: organic cotton, PET recycled polyester, durable materials (1, 2)	Simplified system, durable rollers, toner cartridges are easily re-fillable or recyclable (1, 3)	Hydrogen fuel car, lightweight design, 2-seater car. Focused on fuel efficiency and low emissions (1, 2)	The unprinter focuses on resource efficiency. The team is exploring whether the design can be 'circular' (1)
Value capture						
9. Cost & revenue model. Product pric-ing/ownership model	Premium priced product sales, but high ongoing service (1)	Premium priced product sales (1, 2)	Premium priced product sales, but high ongoing service (1)	Higher price of initial machines, but high ongoing service (1)	Pay per month. Lease pricing comparable to conventional leasing (1)	Per product. In future: sell paper (1)
10. Value capture for others (e.g. environment, society)	Slows resource use (1)	Social value (e.g. skilled jobs) in Umbria region; slows resource use (1)	Slows resource use (1, 2)	Reduces waste to landfill over the product lifetime (1)	Reduces the impact of personal mobility (1)	Slows resource use, saves energy, CO_2 water, chemicals and waste (1)
11. Growth ethos	Accepting slower organic growth; no publicly traded shares (1)	Now trading on the stock exchange, but restricted to organic rates of growth (2)	Grow sustainably and slower (e.g. second hand). Has experimented with zero-growth model (1; Chouinard, 2006)	Kyocera is trading on the stock exchange (2)	Replacing cars with eco-friendly substitutes. Partnering to grow (1)	"An unprinter for every printer" is the aim – still in start-up phase (1, 2)

Table 3
Application of the 'sustainable business model archetypes' to the cases. Note. The archetypes are: optimise resource efficiency; closing resource loops; substitute with renewables and natural processes; deliver functionality rather than ownership; adopt a stewardship role; encourage sufficiency; create inclusive value creation; re-purpose the business for society/environment.

Vitsœ	Cucinelli	Patagonia	Kyocera	Riversimple	Reduse
Encourage sufficiency; adopt a stewardship role	Encourage sufficiency; adopt a stewardship role	Encourage sufficiency; re-purpose the business for society/environment; adopt a stewardship role	Encourage sufficiency; optimise resource efficiency; closing resource loops; deliver functionality, not ownership	Encourage sufficiency; deliver functionality rather than ownership; substitute with renewables and natural processes; re-purpose the business for society/environment; optimise resource efficiency	Encourage sufficiency; optimise resource efficiency; closing resource loops

Adapted from: Bocken et al. (2014).

5. Discussion

How can sufficiency serve as a driver for business model innovation for sustainability? This paper, through the cases presented, shows that sufficiency can be embodied through multiple mechanisms within the business model.

5.1. The business model and economic rationale

The cases present comprehensive approaches to sufficiency integrating a broad array of initiatives within their respective business models. Table 4 provides an overview of the business model initiatives observed from the cases and other illustrative cases from the literature.

Which types of revenue models might sufficiency-driven companies pursue? Companies driven by sufficiency might often adopt a premium business model (Bocken et al., 2014). The premium model is common across the cases, and appears to be justified with B2C and B2B customers through product differentiation, high levels of service, extended warrantees and by treating key stakeholders well. However, as Table 4 shows, premium pricing is not the only solution. Sufficiency can also generate cost savings and environmental benefits, for example through reduced paper use in the case of Reduse or longer life products, which need to be replaced less often. It can also be compatible with convenience, for example through car club models such as Riversimple's model. Riversimple taps into a new market of consumers seeking access to cars without requiring ownership in the most sustainable way. Hence, although the 'premium model' seems to dominate (e.g. Cucinelli, Vitsœ, Kyocera and Patagonia) and is seen in other sustainability initiatives such as Fair-Trade, this is not the only route to business and 'pay per month or use' (Riversimple) or more conventional sales models (Reduse) may deliver sufficiency.

The most obvious concern in creating a sufficiency-based model is that if the sales cycle is reduced or curtailed (e.g. by offering a product that lasts longer or forever) then overall market demand must ultimately shrink. This reduction in repeat-business and expansion opportunities means that to survive a sufficiency-based model needs to continually seek and win new customers or develop other forms of income (e.g. services). The case studies demonstrate that through careful business model design, differentiated value propositions can be developed to appeal to consumers, create competitive advantage and support sufficiency. Competitors may try to mimic these businesses, but if they do, this is perhaps only a positive sustainability benefit (e.g. following Patagonia's lead, numerous companies in the outdoor apparel sector now emphasise their ethical credentials and some offer repair or reuse solutions). Even though sufficiency has been demonstrated in the presented case studies, it may be much harder for large multinationals that already have a dominant market share to justify sufficiency approaches as they would more likely experience an absolute reduction in their business.

Table 4
Sufficiency-based business model innovations observed from the cases.

	Business model initiative	Value creating logic	Examples
1	**Sharing; no ownership** Sharing the same product across multiple customers. The customer never 'owns' the product. Rather, a service is sold	The firm is paid for the service (e.g. car access) rather than ownership (of cars). For the customer this can create convenience and transparency (car availability and full service)	Riversimple, other sharing models: Zipcar, BlaBlaCar, Couchsurfing, Airbnb (Chase, 2012)
2	**Demand reduction services** Solutions that mitigate the use of energy and resources by individuals and businesses - Provision of add-on services that assist consumers in reducing consumption - Public subsidies and, or preferential tax treatment may be used to strengthen the business case	The firm is paid for services, while the consumer makes savings that are greater than the fees, so both consumer and firm benefit It may be necessary to strengthen the business case and provide incentives for consumer or provider adoption	ESCOs (FOR A, 2010), Kyocera, Riversimple E.g. energy feed-in tariffs, green-deal subsidies for home insulation, etc.
3	**Moderating sales and promotion** Conscious action to moderate sales activities – eliminating manipulative consumer marketing campaigns, no sales incentives, choice editing	The business model is built on customer long-term relationships and trust in payback in terms of loyalty and reputational benefits. Revenue models are often focused on premium pricing	Vitsœ, Patagonia
4	**Extending product life** Provide products designed to last a lifetime (eliminate built-in obsolescence), be repairable, upgradable, and not subject to fast-fashion trends	The business model is built on long-term customer relationships and trust, leading to loyalty and reputational benefits, and follow-on services. A premium price or service charges can justify slower sales. Customers benefit in through-life cost savings	Cucinelli, Patagonia, Vitsœ
5	**Direct reuse** Creation of second-hand markets for used goods to reduce waste to landfill or idle assets	Consumers are encouraged to pay premium price because a strong used market creates re-sale value offsetting initial higher purchase costs	Patagonia in partnership with eBay
6	**Full life cycle sufficiency** Design and product use are focused on minimising resources, the most important example being 'frugal innovations'. Unfortunately most of these solutions have been mainly focused on low income countries, not developed countries	Depending on the type of product (frugal or premium) affordable or premium pricing is adopted. In both cases, customers benefit from cost reductions in the use phase (e.g. energy). In frugal innovation, social enterprise models with lower profit drive might be used	Kyocera's full life cycle impact approach; frugal innovations (Bocken et al., 2014) based on simple technology and low impact across the life cycle

5.2. Enablers of sufficiency-based business

The case studies consistently present a number of enablers and pre-requisites that seem important for successful innovation for sufficiency. These need to become mainstream considerations in business education and business practice and encouraged through appropriate legislation and policy intervention:

1. Corporate governance orientation towards sufficiency driven from the top (Vitsœ, Cucinelli, Patagonia, Riversimple, Reduse).
2. Performance and incentive systems aligned with the sustainability objectives of the firm (e.g. do not reward over-selling, no sales commissions) (Vitsœ, Patagonia, Kyocera, Riversimple).
3. Strong and consistent communication of corporate values both internally and externally (all cases).
4. Commitment and perseverance to go against the business-as-usual trends (all cases).
5. A strong focus on quality and durability (mainly Vitsœ, Patagonia, Kyocera, Cucinelli).
6. A strong focus on customers – building long-term relationships, using existing customer's word-of-mouth recommendations as an important means of promotion (Vitsœ, Cucinelli, Patagonia, Riversimple, Kyocera).
7. Radically different marketing initiatives and campaigns relative to industry norms – focused on moderate sales (Vitsœ, Cucinelli, Patagonia, Kyocera).

8. Preference for organic growth rather than highly leveraged growth and acquisition in order not to dilute or lose the corporate ethos and values (Vitsœ, Cucinelli, Patagonia, Riversimple, Kyocera).

Expanding on the final point, rapid growth intuitively seems incompatible with sufficiency and sustainability, and as such, Vitsœ, Cucinelli and Patagonia have purposefully adopted strategies of organic growth only. Patagonia has in the past gone even further and experimented (unsuccessfully) with a zero-growth model, but even now still keeps growth to low rates (Chouinard, 2006) – zero growth was found to create motivational problems for staff within the company as without growth the opportunities for promotion and personal development opportunities were greatly diminished. Targeting lower growth rates has both positive and negative effects on the businesses. Restraining the growth rate is seen to be an important mechanism to maintain corporate culture and ensure entire supply chains and sales and distribution networks remain aligned with the core values of the company (e.g. Cucinelli, Vitsœ). On the other hand, constraining the growth rate reduces revenues, limits market penetration, and is less attractive to investors (both Vitsœ and Riversimple highlight ongoing challenges with financing), which in a competitive market or one where radical change is needed at the industry level may be a great impediment to having impact or even surviving. To deliver meaningful system-level change, there may simply not be time to wait for small disruptive players to grow organically. While sufficiency seemingly implies that there should be little or no growth, one can argue that companies can and should grow rapidly if they are to have any meaningful impact on the world: What matters is whether they are reducing overall impacts by undermining or displacing the conventional more environmentally harmful businesses – that is, their growth is less than the overall decline in demand that they precipitate in the markets they serve.

5.3. Barriers to adoption of sufficiency models

The question remains whether all companies in all sectors can adopt such strategies and how they might engage less concerned mass-consumer markets with premium prices. Although as shown in the cases sufficiency can offer differentiation and competitive advantage, there may be barriers that hold back businesses from taking a sufficiency-driven approach based on our cases:

- They are structured as a public limited company (plc), characterised by public shares and focus on short-term shareholder value maximisation and so may struggle to persuade analysts and investors of the need for a longer-term approach (*Riversimple, Patagonia and Vitsœ have explored new ownership and governance models to reduce this influence*).
- Business continuity in a classic business model form is based on repeat sales and selling more units over time to generate a profit. Built-in obsolescence (designing products to fail prematurely) and fast-fashion are part of business models introduced to support industrial models of mass-production (*Vitsœ, Kyocera, Patagonia and Cucinelli in particular try to battle built-in obsolescence*).
- Competition is fierce and often focused more on price than on quality and durability and firms use sophisticated marketing strategies to promote consumption. The incumbent multinationals that dominate global production have a distinct advantage on costs (economies of scale), and marketing budget and reach, making it difficult, although not impossible, for small disruptive firms to make an impact and win customers.

From a customer perspective there are other reasons that hinder a sufficiency-driven approach: Consumers seek variety and novelty (driven in part by marketing, social conformance, and a disposable-society mentality); seek status and prestige through ownership and use of the latest gadgets or prestige goods; and seek performance benefits through technological innovations. From a systemic perspective, a consumerism culture, affordability (i.e. upfront costs) of more durable products, difficulties in defining appropriate levels of sufficiency, and concerns about the effects of slower growth can be barriers. The characteristics of consumer behaviour and the influence of marketing and promotion are well documented in the literature and it is beyond the scope of this paper to explore them in great depth here. However, they are without doubt a significant challenge for sufficiency initiatives, and promotional activities must be tackled in parallel with business model innovation as

highlighted in several of the cases (Vitsœ, Patagonia). For a manufacturer, making durable products generally means they are more costly to produce and necessitate higher prices, which may be unattractive to customers. A challenge identified by the cases (Patagonia, Vitsœ and Kyocera) is that although over the longer-term better products can offset their premium prices, consumers are not good at considering future benefits and costs and often under-value future benefits significantly. Even where benefits are recognised, consumers may struggle to finance higher upfront costs and continue to buy cheaper less durable products. Education is important to ensure consumers are fully cognisant of the impacts of their purchasing and consumption decisions. Business models can play a role through the use of product-service offerings, leasing, or other financing solutions that enable consumers to access a more expensive product or emerging technology by deferring part or all of the upfront cost and risk. For example, Riversimple use the service model in part to facilitate adoption of their cars. In the case of Reduse and Kyocera, their early stage adoption strategies focus on large corporate customers, as these are more likely to understand and engage with the through-life benefits offered.

Finally, one of the barriers at the national and global level for sustainability seems to be in defining appropriate levels for sufficiency. In the developed world, perspectives on sufficiency and perceived essential needs are far removed from those in many developing nations. Cultural norms and values, education and awareness, relative affluence and expectations, and local availability of natural renewable resources may greatly change definitions of sufficiency from one consumer, company or geographic region to another. This introduces a level of subjectivity to the term 'sufficiency' that makes it difficult to apply uniformly and measure (unlike efficiency measures, which are more easily quantified and understood). This in turn could make regulation and legislation problematic and inhibits experimentation and uptake, as there are few clearly defined expectations, standards and role models. There is also the question of how much should and can industry and government intervene in private consumption decisions and patterns. Yet, a more concerted effort is almost certainly required particularly in the rich developed nations to moderate some of the excesses of consumption. Consumer resistance to such changes even where there is strong evidence of the negative impacts of excess (e.g. smoking) illustrates the challenges in shifting consumer behaviours.

5.4. *Sufficiency as a catalyst for reforming our growth-driven economic system*

Young and Tilley (2006, p. 414) ask "Can a company ever be sustainable when it has no limit on sales and hence consumption? How can a company be aware of its limits to growth when other unsustainable companies will just keep growing, in the short term, taking sales?". More fundamentally, can sufficiency-driven businesses serve as a catalyst for wider reform of our growth-driven consumerism-based economic system, which is currently a root cause of unsustainability and over-consumption? While it is difficult to address these fundamental questions based on a limited number of emerging cases, we seek to provide our view based on the work presented in this paper.

The pressure on resources is expected to push significantly different new ways of doing business in the future (WBCSD, 2013), and if current predictions (e.g. Randers, 2012) are correct, it seems inevitable that at some point firms, industries, nations, and ultimately the vast majority of global society will have to adopt some form of sufficiency-based approach to production and consumption. This will not be out of choice, but out of necessity. It seems quite feasible that the future will see quotas and caps imposed on consumption, or at least concerted policy interventions to actively encourage reduction in consumption in certain key sectors (similar to today's ESCO initiatives in the energy sector). Based on Randers (2012), energy, water, food and probably textiles will be the first industry sectors to be squeezed. Shedding new light on 'sufficiency' as a driver for business model innovation for sustainability might help stimulate more research and experimentation in this direction and prepare for these coming challenges. Wider adoption and awareness of business models driven by sufficiency might facilitate the 'normalisation' of such models, create social acceptability with consumers, and, perhaps more importantly, demonstrate the financial acceptability, or, the business case to potential investors and management. There is also an important and critical role of policymakers to move 'sufficiency' out of the niche space, for example, by creating a minimum product life through mandatory longer product warranties, mandating adequate and affordable repair and reuse services, creating zero-textile

waste to landfill policies, placing restrictions on corporate sales and marketing strategies, and industry specific policies (e.g. mandating *x%* of all printing must be on 'reused' paper).

Concerns (or perhaps hopes of some) that sufficiency-based models will undermine the current consumer economy and cause economic collapse, although hard to predict, are probably unfounded as sufficiency as a business driver will be introduced incrementally and can be the mechanism that enables industry and the world to continue to develop further and serve the growing population in a more sustainable manner. In every big transition there are winners and losers, and as resource constraints become more acute (e.g. WBCSD, 2013) and the impacts of climate change worsen (IPCC, 2014), sufficiency-based models may well undermine or destabilise traditional approaches to business and cause large incumbent firms to fail. However, reduced material consumption will not mean the end of business. In the longer-term such an outcome may perhaps serve as a catalyst for more fundamental change in current consumption-orientated and growth-based economic systems. What seems likely is that economies will continue to be growth-based at least for the foreseeable future, but growth will increasingly be driven by provision of services (e.g. Chase, 2012) and premium-priced goods (Bocken et al., 2014). This will emphasise delivery of higher perceived customer value and creating higher social value with reduced material consumption, hopefully with an increasing focus on delivering well-being and more meaningful value rather than consumerism and over-consumption (see e.g. Jackson, 2009).

5.5. Contributions to existing literature

The concept of sufficiency and reducing demand to satisfy needs rather than unlimited 'wants' is not new. Sufficiency was a key part of traditional lifestyles pre-industrial revolution and the relatively recent age of consumer marketing. Many developing nations, even though they are well behind in many respects regarding consumption and sustainability, by necessity practice many better sufficiency strategies than the developed world because their financial situation forces them to be frugal, avoid unnecessary consumption, and make much greater use of repair and reuse in everyday life. Such initiatives will need to be reinvigorated particularly in the developed world under increasing resource and climate pressures. However, at present, a large part of the population has easy access to too many resources and often places a higher value on convenience over broader environmental or social considerations, while the majority of industry and government do everything possible to encourage unfettered consumption.

The framing of 'sufficiency' as a driver for business model innovation is seen as a key contribution of this paper. Sufficiency can be an important strategic approach for sustainability which is integral to the way of doing business, rather than merely an ad hoc approach of responding to niche customer demand or avoiding boycotts, as was formerly described in Dyllick and Hockerts (2002). Fig. 1, the 'sustainable business model framework' was found to be useful to map and explain the different case studies, with the caveat that the role of corporate governance as listed in Sections 5.2 and 5.3 cannot be fully captured in the business model. Sufficiency seems to act not only as a business model innovation, but also as an over-arching ethos for the companies and hence may transcend the elements of the business model.

The waste hierarchy was found to be a useful visualisation (Fig. 4) to explain what sufficiency might mean for a company and which sufficiency strategies are preferable as part of their business models. The cases primarily focus on the higher levels of the waste hierarchy – avoid, reduce, and reuse. Although these strategies are not 'mutually exclusive' and there is clearly overlap between categories, the waste hierarchy does show the various options for sufficiency.

The case companies have successfully developed sufficiency into a business proposition, showing that sufficiency does not necessarily have to be far away from the business case. When analysing the cases using the sustainable business model archetypes (Table 3) it becomes apparent that all cases focus on 'sufficiency', but there are a range of complimentary business model archetypes pursued by the companies. Additionally, it is observed that while 'sufficiency' can be a discrete business model archetype in itself (as proposed by Bocken et al., 2014), sufficiency can also be engendered through various other business model archetypes (e.g. Riversimple's product-service-system model). As recommended by Young and Tilley (2006), Dyllick and Hockerts (2002) and Bocken et al. (2014)

the companies pursue multiple strategies simultaneously to create integrated solutions to optimise sustainability outcomes.

6. Conclusions

This paper has developed insights into sufficiency as a driver for sustainable business model innovation and finds that there can be a good business case for companies to take a proactive approach to sufficiency, rather than merely adopting a reactive response on an ad-hoc basis to consumer or regulatory pressure. As such, this paper offers an important extension to the limited extant literature on sufficiency as a business strategy.

Sufficiency is embodied in the most environmentally most preferable options in the waste hierarchy of avoiding, reducing and reusing, and, far from being just an add-on approach to business, sufficiency across the business model can be seen as a holistic strategy. A sufficiency approach can affect environmental benefits across the product life cycle from raw material extraction to production through to consumer and beyond. More sufficiency driven businesses and business models will need to be pursued to normalise such approaches and drive change in consumption and production.

Legitimate questions remain over how far industry can be expected to pursue sufficiency models independently. While the models presented are successful, their application across all sectors and regions is not clear. In particular while the models are feasible for innovative new start-ups and smaller companies, the large multi-nationals that facilitate most of the world's consumption would suffer by encouraging sufficiency or demand reduction, and so seem unlikely to willingly adopt such strategies. Specific sector policies (e.g. minimum product life times and warrantees) and wider reform of the economic system (e.g. emphasise wellbeing or happiness rather than economic growth) are therefore likely required to push sufficiency in business models more widely and quickly.

These cases are of interest in their own right as exemplars of industrial sustainability integrating a range of initiatives and approaches to deliver enhanced social and environmental outcomes, but foremost these cases present sufficiency approaches and demonstrate the viability of such businesses. The paper offers interesting templates for disruptive business models that can drive sufficiency and achieve success within current economic models, and more importantly perhaps offer a blueprint for future broader business within a sufficiency-based economy.

This research was limited by a small number of cases in developed countries. This might limit generalizability to wider contexts, but it provides a positive base for further exploration of this emerging area. It will likely be increasingly important to investigate 'sufficiency' across multiple contexts (companies, industries and countries) as pressures on resources and the environment intensify (WBCSD, 2013). Further work is necessary to develop the concept of sufficiency as a driver of business model innovation for sustainability, but this paper presents a positive perspective on sufficiency and a preliminary basis for further research. Future research might pursue the inclusion of examples across developing countries where different consumer priorities, regulatory and cultural contexts may have facilitated other interesting approaches to sufficiency. Future research could also profitably explore what specific policy levers might be required to encourage firms to move towards sufficiency-based models and better understand the political and social barriers to implementing such policy changes.

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