SUSTAINABILITY INNOVATION DEVELOPMENT IN NETWORKS – THE CASE FOR DIRTY INDUSTRIES

ABSTRACT

Sustainability and sustainable development are considered a major problem and to date several initiatives have been designed at encouraging consumers to use fewer resources or for organisations to produce less environmentally damaging products and processes. The majority of these have failed or have been only slowly adopted. Sustainability innovation is seen as the way forward in achieving the global ambitious sustainable development targets. This involves the development of new products and processes not focussing on "business as usual" economic parameters but on radical new business models focussing on "triple bottom line" parameters involving social, environmental as well as economic attributes.

This article examines two case studies with the first case examining the issues of how a major environmental waste management company manages the development of new, innovative hazardous environmental waste management solutions with a major pharmaceutical client and the second case evaluating the issues surrounding a major European automobile manufacturer developing and launching an innovative range of environmentally friendly automobiles. The aim of the study is to identify how sustainability ideas, products and processes are developed within these two industry settings.

Innovation in new product and process development are believed to follow relational, interactional and network models between suppliers and customers such as those prescribed by the Industrial Marketing & Purchasing (IMP) Group. What we find is that in both cases end consumers play a very limited role in sustainability innovation development and are rarely consulted or even aware of the organisations decision making. This reflects a one sided supplier-push form of new product development long since defunct in other areas of innovation, which may go some way to explaining their lack of diffusion. Suppliers and regulators are believed to be compromising network effects from being transactional rather than relational in their customer interactions.

KEY WORDS: Sustainability, Technological, Innovation, Networks, IMP, New Product & Process Development.

Competitive Paper

INTRODUCTION

Sustainable development in terms of development that meets the needs of the present generation, without compromising the ability of future generations to meet their needs (Brundtland Commission, 1987) has become "the management challenge of the 21st century… Companies must develop the tools to respond to these challenges if they want to retain their licence to operate and build the foundations for sustainable growth" (Doughty, 2012: xiii). Businesses therefore need to play a central role in developing suitable products and processes that facilitate sustainable development (Kleef & Roome, 2007; Hansen *et al*., 2009). However, the Brundtland Commission's definition and subsequent research on sustainability fail to define the steps companies need to take and the processes required for creating new sustainable products (Petala *et al*., 2010). Incorporating sustainability into the

formal development processes of organisations represents a major challenge requiring further study.

Although the development of new innovation is a large and well developed field of research, the process through which organisations successfully introduce innovations to the market has limited research (Teece, 2006; Chesbrough, 2007). The nature of this process is only now beginning to receive greater attention in the 'mainstream' innovation literature (Baden-Fuller *et al*., 2010) leading to the realisation that innovation rarely – if ever – happens solely as a result of the work of one individual or one organisation (Wilkinson, 2008). When it comes to sustainable innovation this couldn't be more true with industry bodies, regulators, pressure groups and the media all having high salience when it comes to sustainability solutions (Mitchell, Agle and Wood, 1997). However, the process of sustainable innovation design and marketization is barely discussed (Charter et al., 2008; Schaltegger et al., 2012; Tukker and Tischner, 2006; Wells, 2008) and few studies progress to a networked or stakeholder perspective of sustainable innovation (Baraldi et al., 2011; Nogueira, et al, 2010; Håkansson & Waluszewski, 2002a & 2002b and Oberg et al. 2009). The purpose of this paper is therefore to explore the sustainable innovation process in two leading companies to better understand the development and diffusion process for sustainable innovations and the role different stakeholders play in the development of these innovations.

THEORETICAL CONSIDERATIONS

Sustainability has had a major influence on academics, business people and policymakers as the belief that careful management of the planet's scarce ecological resources is an antecedent to sustained economic growth has become more prevalent (Connelly et al, 2011). It has been described as "the greatest challenge of our time" (Mulder et al, 2011:1), bringing together a number of global problems including pollution, poverty, starvation, climate change, depletion of resources, ecological devastation, and global inequity.

To date many government initiatives focus on educating consumers to behave more responsibility by consuming less. However consumption, and especially technological consumption, is deeply rooted in our society and would likely collapse without it. Therefore finding alternative sustainable technologies although difficult is far easier than changing socio-cultural conventions (Mulder et al, 2011). Therefore on the other end of government intervention is subsidising or regulating technologies, in particular stipulating the adoption or development of allegedly "more-sustainable" products, such as hydrogen fuel cells or electric cars, or disuse of supposedly "less-sustainable" technologies such as creosote or use of plastic bags. This places the burden of dealing with sustainability on businesses.

Businesses are therefore increasingly pressured to identify solutions to better manage the future sustainability of the planet's resources. They are asked to develop appropriate sustainable technologies as they are held responsible for the effects of their products, as well as being in possession of both the resources and global reach to develop appropriate solutions (Hansen *et al.*, 2009). There are two primary routes for businesses to incorporate sustainability into their product development processes. One way is for them to develop products with lower environmental impact therefore replacing current products in an organisation's portfolio and the other is to incorporate environmental considerations into the regular development process for all products included in a company's portfolio, making it an integrated part of the mandatory design criteria and methods. Both routes represent different levels of complexity (Tingström and Karlsson, 2006).

DEVELOPMENT OF SUSTAINABLE INNOVATION

According to Patermann inVan Dijken et al (1999) considerable progress was made in the 1990's regarding knowledge of environmental problems and the development of many solutions. Unfortunately, the diffusion and adoption of these innovative, cleaner technologies has been slow (Patemann in Van Dijken et al, 1999). Many sustainability initiatives have been successfully developed but only slowly adopted and diffused, such as electric cars, straw bale housing and micro-power generation. There are, however, countless other failures which never see light of day and the success stories are far outweighed by the failures.

Even within single organisations there are examples of mixed success and failure (Abbett et al, 2010). Selin & Ola Linnér (2005: 1) comment that "four decades of extensive high-level international cooperation and policy making on environment and development … have proven to be a long and difficult road … [with] few policy successes [and] a frequent lack of effective implementation and behavioral changes".

Rogers (2003:1) suggests that "getting a new idea adopted even when it has obvious advantages is difficult". Therefore many standard innovations require lengthy periods between development and when they become widely adopted. Nogueira et al (2010: 7) claim this is even more of an issue in sustainable innovation because it requires not only technical change but changes in social and cultural values. Sustainability can therefore be described as "radical innovation", which is defined as disruptive changes that tends to have more of a dramatic impact on the market place and competitive structure (Peschl, Raffl, Fundneider, & Blachfellner, 2010). Radical innovation is much slower to diffuse than incremental innovation and may go some way to explaining the lack of progress on sustainable innovation diffusion. Sustainability innovations however also involve the adoption of complex integrated scientific, technical, social, economic and moral issues potentially requiring significant shifts in attitudes, values and beliefs amongst individuals, groups, organisations and society (Lyytinen & Damsgaard, 2001). In essence the diffusion and adoption of sustainability is very complex and requires change and interaction amongst many different stakeholders.

NETWORKED INNOVATIONS

Innovation is no longer perceived as an activity carried out by visionary, isolated individual entrepreneurs but as a process carried out in relationships and networks (Baraldi et al, 2012; Wilkinson, 2008). Modern organisations tend to engage in open innovation processes (Chesbrough, 2003; Fichter, 2009; Ruiz Parraguez, 2010), as opposed to "closed innovation" which focuses on the internal capabilities of the R&D departments of single firms (Gianiodis *et al*., 2010). Open innovation involves the exchange of knowledge, resources and capabilities through networks of external partnerships. When it comes to radical innovations the involvement of inter-organisational networks is even more important because of the fundamental shifts in marketplaces, industry and society in order for radical innovations to take off (Peschl et al., 2010). The sustainable innovation (SI) literature therefore presents a process of balancing continuous interaction between ecological, economic and social values involving inter-organisational networks and wider societal systems including other stakeholders as well as firms (Boons & Lüdeke-Freund, 2012).

In complex environments we see the rise of Virtual Customer Environments (Nambisan and Baron, 2009), or complex co-creation processes (Payne, Storbacka and Frow, 2008; Prahalad and Ramaswamy, 2004) to ensure customers have built emotional attachments to new innovations before it reaches the market and are more prepared to invest in it. Co-creation of innovation however does not only happen with customers but with other network partners

and stakeholders and is therefore also espoused as leading to higher levels of intellectual capital (Hatch and Schultz, 2010; Homburg et al., 2008; Ballantyne and Varey 2008), more marketable and faster rates of innovation (Zwass, 2010; Fuller, 2010; Mattsson, 2010; Marandi *et al.*, 2010); psychological benefits for all parties concerned in terms of belief, trust and attachment to the innovation (Andersson and Hultman, 2010; Jaworski and Kohli 2006; Prahalad and Ramaswamy, 2004) and better brand image in the marketplace (Merz *et al.*, 2009; Bowonder *et al.*, 2010; Hatch and Schultz, 2010). Networks and relationships are therefore essential to the innovation process as few firms have the capabilities to develop innovations entirely in-house. They are reliant on resource transferred and shared between actors and organisations across a broad network (Pittaway et al., 2004; Rice et al., 2002). Network theories have therefore been combined with diffusion of innovation theories to track the pathway of adoption and diffusion (Valente, 1995).

According to Eccles et al. (2011), sustainability is also established through complex networks by developing structured and explicit values and belief systems and establishing a cultural belief amongst an organisation's employees about how they relate with both internal and external stakeholders. Nogueira et al (2010: P2) claim that "systems and network approaches are needed to fully understand the development of [sustainability] strategies since the transition towards environmental sustainability is complex, problematic and with long-lasting consequences". Oberg et al (2012) similarly argue that network-level analyses are better at capturing actual environmental consequences than present assessment models based on single entities.

THE INDUSTRIAL MARKETING & PURCHASING (IMP) GROUP PERSPECTIVE ON NETWORKS

Technological and knowledge resources in these partnerships can either diffuse inwards or outwards at any stage (Lind et al, 2012). Networks and relationships have become (or always were) fundamental to business and industrial marketing (Håkansson, 1982, Håkansson and Lundgren 1995, Håkansson et al, 2009) and are essential to sustainability solution development because few firms have the capabilities to develop solutions in isolation (Pittaway et al., 2004; Rice et al., 2002).

Holmlund and Törnroos (1997) claim that although organisations develop some of their resources internally within the organisation, most resources are developed or acquired through forming relationships with third parties embedded in a business network. These resources may consist of "financial, human and/or technological assets" (P306). The business network provides opportunities for combining "complementary skills and heterogeneous resources" which is seen as a major strength of business networks. One of the characteristics of business is that since the 1980s there has been evidence of "the vertical disintegration of hierarchies and the formation of alliances and different types of business networks" (Holmlund and Törnroos, 1997).

The ARA (Activities, Resources and Actors) model (Hakansson & Johanson, 1992) and the industrial network approach (Hakansson & Snehota, 1995) views supplier organisations as embedded within a network where value is created within the network rather than in the originating organisation. The IMP approach suggests that the adoption of new ideas (in our case sustainable products & processes) within organisations from third party suppliers is influenced by all historical relationships (Håkansson, 1982) between the buyer and supplier organisations. This brings into consideration all previous transactions as well as the interactions (Turnbull & Valla, 1986) between actors or stakeholders between both

organisations. In addition later IMP studies showed that additional relationships with other parties, termed network influences (Håkansson & Johanson, 1992; Håkansson & Snehota, 1995), also affected current and future transactions between supplier and buyer firms. Network structures can therefore be seen to ease or impede the adoption and diffusion of new ideas based on the historical and social ties (Thompson and Driver, (2005). Sustainable development itself could also therefore be seen as reinforcing the necessary values and beliefs within networks by maintaining commitment and trust where these ideas are shared (Morgan & Hunt, 1994; Achrol, 1997).

The IMP perspective of business networks is slightly different from other network theories in the sense that resource ties and activity links are seen as constituents of a network in addition to actor bond. Resource ties and activity links can rest comfortably within sustainable development strategies as sustainability relies heavily on working more effectively, efficiently, responsibly and ethically with resources and activities of a focal firm and its supply network.

Although there are several articles relating to the development of technological innovations in networks (Håkansson, 1987) there are only a few reported studies relating to the development of sustainability innovations in the network literature. Notable exceptions include Baraldi et al's (2011), Nogueira, et al, (2010), Håkansson & Waluszewski (2002a & 2002b) and Oberg et al. (2009). Therefore in this paper we explore the process of developing new radical sustainable innovations and the role network / stakeholder partners play. We aim to uncover the roles played by different partners and the potential impediments these cause to the successful diffusion of sustainable innovation.

METHODOLOGY

The objective of this research is to gain a greater depth of understanding into the development of new sustainable technologies. As this is an area with little contextual understanding in the extant literature, we take an exploratory line of enquiry (Miles and Huberman, 1994) to allow insight to emerge from the research data (Glaser, 1992). Baker (2001) states that "In the case of exploratory research when one is seeking to 'get a feel' for a situation it is often best to follow an unstructured approach rather than impose a preconceived structure on it" (p. 375). To generate the necessary contextual understanding a qualitative, inductive research design was preferred and no prior hypotheses were developed.

A case study approach was adopted using predominantly semi-structured interviews. These methods were supported with secondary evidence in the form of company reports, press cuttings, internal memos and web sites. The supplementary data sources provided some background as well as verification tools for triangulation with the qualitative work.

Sampling of case studies is crucial, as the choice of sample influences the results of a study (Miles and Huberman, 1994). The cases were selected because of the 'dirty' nature of the industries involved exposing the companies to many salient external stakeholders when developing sustainable technologies. Being in industries typically on the sharp edge of public and media attention on sustainability issues (cars and hazardous waste), they are both leading companies with a need to develop sustainable alternatives to their core business models if they are to address sustainability issues within their industries. They were also selected for their diversity: one working with industrial customers and the other consumer products allowing for greater theoretical development through theoretical replication (Eisenhardt and Graebner, 2007).

We explore the process of new innovation design and diffusion by interviewing both designers and internal and external stakeholders such as marketing people, technical people and customers. In total 12 interviews were conducted on Waste Management Co. (3 internal- with quotes identified by letter W (+ Code No of interviewee), 9 external- with quotes identified by letter P (+ Code No of interviewee) and 10 interviews with Automotive Co. (4 internal – identified by letter A (+ Code No of interviewee), 6 external identified by code C (+ Code No of interviewee)). Questions focused on the specific market conditions in which products were being developed, the role of different stakeholders in the development, and how this differed from other technological innovations within the network.

Data analysis is based on a grounded theory approach (Glaser & Strauss, 1967; Spiggle, 1994; Strauss & Corbin, 1990). A constant comparative method is used to ensure internal validity and reliability (Barnes, 1996) and data sources are interpreted collectively to identify underlying rationales (Rubin & Rubin, 1995). Analysis is carried out inductively using the tools developed by Spiggle (1994). Spiggle adopts a staged system for data analysis which is designed not to run in an ordered fashion, but as operations which need to be conducted at each stage of research development. Utilizing this system we are able to integrate and compare not only the data from each of the focal firms, but also the network partner interviews, secondary sources and observation to provide higher-order constructs describing the intra and inter-organizational nuance.

RESULTS

The major finding of this paper is that although our case companies usually develop innovation through open-innovation, co-creative processes, when it comes to their sustainability innovations they diverge from the norm to concentrate on more of a stage-gate model. In particular the role played by network partners is dramatically reduced / changed in sustainable innovation vs. standard innovation. For ease of reading the data focuses on the three major stakeholders; the internal stakeholders involved in the innovation process, the role of customers and finally the role of regulators. Although discussions about other stakeholders and other themes emerged from the data it is these three groups in which we can see the main divergence of sustainable innovation processes from the standard innovation process.

MOTIVATION FOR INNOVATION

In both cases one can see that the organisations propose implementing a more sustainable business model, focussing on an integrated systems approach considering environmental, social as well as economic benefits. However, in practice one observes that traditional "business-as-usual" models focussing on cost benefit analysis (economic / profit motives) are what is driving strategic sustainability actions within these organisations. Various discussions with the General Manager from the Waste Management Company highlight the conundrum faced by a supplier developing new sustainable innovations. For example the initial motivation for the Waste Management Company to undertake research with their pharmaceutical client was to identify whether "their clients would be happy to pay for the incremental costs of the new technological process for recycling hazardous waste" – W11 which would only be considered "if the clients were happy to pay the higher price to cover the investment costs for the new process" – W11. Unfortunately the client is not willing to bare extra costs for the benefit of better environmental performance:

> *"I think certainly we aim to introduce sustainability for cost neutrality and there is pressure on costs."- P3.*

"For a sustainable solution to manifest itself in an organisation like this it needs to make financial sense as well as environmental sense. If something is right from an environment perspective, but not right from a financial perspective, it is often the wrong solution. You get the right solution when you get the financial benefit and environmental benefit together."- P4.

In reality one technological innovation was scrapped before customers were even asked for their views as it was identified that the new process would increase the tax burden of the Waste Management Company. The Waste Management Company did not think that the increased tax payments plus the investment required to implement the new technology were worth the effort. This story clearly demonstrates the complex interrelationship between satisfying the various conflicting roles of different stakeholders interacting in the process of developing and implementing sustainability innovations. On the regulatory front we have demands being made by environmental government agencies wanting to reduce the emission of environmentally damaging gases by organisations at the same time as tax regulators provide disincentives for companies to invest in less environmental damaging technologies. When the company is left with the choice of satisfying the environmental demands of government over the economic demands of government, the environment rarely wins.
We find a similar story in the Automobile Manufacturer:

"So that the Automobile industry can reach the CO_2 objective of 85g, this would mean an investment of about 200 billion Euros. But the profit pool of the whole automobile industry is only 150 billion Euros. This means to reach the objective, I would have to give up all other innovations." - A4.

Therefore using the terms relating to triple bottom line assessments of sustainability innovations as expressed by Elkington (2004) one can deduce that profit (economic considerations) is what is driving sustainability innovations in these companies rather than people (social considerations) or planet (environmental considerations).

THE INNOVATION PROCESS

As exemplified in the literature our Waste Management and Pharmaceutical Company dyad follows a very modern approach to co-creative innovation design and development. When talking about the typical innovation process the companies exemplify this modern market orientated approach.

"If you think of our strategy in terms of the entire value chain, we cannot afford to think of our business in isolation anymore, we have to think outside of our factory walls … a lot of the solutions to gain efficiency are to work more collaboratively outside of the traditional procurement relationships." - P4.

This approach to co-creation of innovation is backed up by the customer's view of the business and their relationship with the waste management company:

"9 out of 10 times we would highlight the issue and say we have an issue here and we would then work with the supplier for a solution." – P5.

"I think there are probably not many cases within [Pharma Co.] where we can say we have something that is akin to a true partnership. Waste for me is one of those areas where we have some very good collaborative ways of working. There are lots of groups within [our company] which feed into the process that interact with [Waste Management Co.]."- P1.

We see through this that most innovation between Waste Management Co. And Pharma Co. is a modern co-creative process. However when it comes to sustainable innovation we see a marked difference in the approach taken:

> *"Customers often don't have the visibility of their own footprint when it comes to waste or carbon... we have to provide the solution" - W6.*

> *"Currently [Waste Management Co.] lacks the ability to be a networked partner and is pursuing a transactional rather than a relational strategy in developing suitable sustainability strategies with its customers." – W11.*

These quotes show that the Waste Management Company is limiting interaction when developing new sustainable innovations and employing a stage-gate model where they devise and develop the innovation then present it to the customer. The customer then similarly positions itself as a receiver of sustainable solutions - not a co-developer as in other areas of innovation:

> *"We don't know the market place; we don't know the innovation s, they [Waste Management Co.] are really the expertise we look for in waste management." – P10.*

> *"[Waste Management Co.] should come forward with [sustainable] solutions. [We] make them aware of the issue and [Waste Management Co.] should develop the solution." – P5*

In fact, even in the closer relationship between the Pharmaceutical customer and the Waste Management Company the customer could only really remember one occasion in which there was a true co-creation process on a sustainable waste management innovation – compared to the 9 out of 10 co-creation activities on standard innovation processes:

> *'...the one that was jointly done between [Pharma Co.] and [Waste Management Co.] was the recycling of solvents from Worthing to Irvine. In the past they would have been going for off-site disposal. I think there was a bit of innovation in that. I can't remember if it was [Pharma Co.'s] or [Waste Management Co.'s] idea, but it certainly had to be driven forward by both parties.' – P7.*

This is in complete contrast to the standard innovation processes which are very customer orientated.

This same pattern emerges in the Automotive Company. As they are a consumer goods company there is less direct collaboration on all types of innovation with customers. However they are famous as a brand for their customer orientated innovation and high quality functionality of their vehicles.

> *"In the old days we were the best manufacturer of premium products, now we look continuously after our customers, so we became a service provider."- A4.*

> *"Our products must fulfil the wishes of our customers." - A1.*

They are famous for targeting new designs at specific audiences in the luxury end of the car market and have a very clear segmentation and targeting strategy in place for their entire product line. They therefore have a very loyal and repeat purchase market for their vehicles and design new generation vehicles to be a clear progression from previous generations. Yet the development of the electric car is a shift from this core market:

> *"Those who buy electric cars are completely different from those buying a [Auto Manufacturer's] sports car like the [Brand X]." - A3.*

A3 claims reflects that of all the Automotive Manufacturers executives that the segments of customers who drive electric cars are both well-defined and distinct from drivers of combustion engine cars, so there will be no spill over resulting in cannibalizing the sales for internal combustion engines. The development of the electric car is therefore in no way intended to improve the sustainability of the company or industry by making the sustainable product the new norm for the business, or integrating it into the core product offering of the business - but as a bolt on to the company's portfolio not targeted at their loyal customer base.

> *"[e-car] is a pure political stunt that is thrown over the consumer." - A Customer 5.*

> *"If you come with the mind-set, every car must be able to do everything, then you do not need an [e-car]. …. If you follow the other mind-set and say, not every car must be able to do everything, then the [e-car] makes sense providing a great offer and is fun."- A1.*

In fact the manufacturer explicitly states that the car will be bought "in addition" to a standard vehicle - thus doubling the manufacturing environmental footprint for consumer vehicles, not increasing sustainability at all. As with the Pharma client for Waste Management Co. the Automobile Manufacturers customers have little interest in the new sustainable alternative:

> *"e-mobility is of no importance. It is more a political push than a legitimate way of reducing CO2 effectively."- C5*

> *"I cannot understand the jump into e-mobility. We are drivers who want shift gear sticks." - C10.*

In fact the Auto Manufacturer clearly indicates that it did not consider, consult or design the e-car with a customer in mind. One customer stated that the e-car "does not fit to [the image of the Automobile Manufacturer]. It is all about horsepower and not to save the environment." - C3. Although the product has gone on the market the purchase process for the car is very different to standard combustion engine vehicles. For instance it cannot be bought through the manufacturer's ordinary dealerships - only from the manufacturer's website and selected partners - and even then only as a customised vehicle (therefore vastly inflating the price). It also has a very different (and in our opinion worse) website design to the corporate standard. And although released to some critical acclaim for its performance vs. other electric cars, the styling and exterior design (a usually high point for this manufacturer) has been widely criticised for creating a 'pug-shaped' (after the breed of dog) design, or being "over-done ", making it an ugly and unappealing car. Diffusion is therefore almost designed to be limited with existing customers suggesting:

> *"Disadvantages overweigh. I cannot see any advantages. The disadvantage for me is the limited power of the battery. I do not see any ergonomic nor ecological advantages. Another disadvantage would be the repairs. Maybe there is an advantage for the EU judges, who would judge [Auto Manufacturer] less severely in the CO2 matter."- C5.*

> *"A disadvantage limiting a purchase decision is the search for docking stations. Also the automatic charging at the electric refuelling stations is not something I feel comfortable with, even when being able to control it by using a Smartphone."- C9.*

> *"The Human is an animal of habit. I can imagine that the transition to the [e] series will be difficult."- C10.*

In the case of the Automobile Manufacturer we can highlight a complete lack of emphasis on the customer as part of the design process. In reality they created the e-car as a risk

management initiative to avert regulators eyes - not as a customer orientated product design as in all previous generations of innovation.

THE REGULATORS

Within both organisations one can observe that they are operating within highly regulated environments. Regulators are attempting to minimise physical damage to the environment through reducing the harmful pollution outputs and resource utilisations in new product or process design of organisations. The debate surrounding regulation within the sustainability arena has been controversial with debates surrounding formal governmental regulation processes being implemented or whether it is better for organisations to self-regulate.

We find that regulatory bodies within these industries see themselves as policeman and solely being transactional rather than relational with the companies. This transactional process is seen as beneficial in terms of safety to end consumers but is also seen as detrimental in terms of the industry developing sustainable innovations:

> *"You do have to be careful when you get too close to the product because it is a regulatory minefield in pharmaceuticals. When you have registered a product and you have registered all the aspects of that product, to change it is a significant undertaking. It is an obstacle."- P8.*

> *"We have to have a step change in our manufacturing processes and it becomes even more difficult. It's very difficult to do in a pharmaceutical environment, because of all the regulations around how you make what you make. Quite rightly, it's governed at a very high level, so I think we've got a challenge around this if we want to achieve those targets."- P1.*

There was evidence from the interviews that professional industry bodies were attempting to develop relational ties with the regulatory bodies to enhance the future of sustainability products and processes in the future.

Regulators are a significant network tie within the pharmaceuticals industry, however the existing transactional orientation of regulators does not allow for the free flow of ideas regarding the radical changes required within the sector to deliver sustainability solutions. Organisations can therefore be restricted from delivering on solutions based on a lack of dialogue between external and internal actors.

What we find in the pharmaceutical waste management case is that although the customer, the pharmaceutical company, is motivated by the sustainability desires and vision of their Chief Executive:

> *"The new CEO… has been in post for a few years and is passionate about [Pharma Co.] doing the right things, both in terms of supplying medicines to patients, but also in the broader Social Responsibility aims…he wants to create trust with patients, community etc." - P10.*

regulators are providing conflicting objectives towards meeting the needs of regulations as well as environmental targets. This is exemplified by the following:

> *"…I think the interesting thing about regulators is that they have been set up to be independent, so they are independent from us, they are independent from the government, and they make an independent decision … but those regulators may not*

have the same kind of understanding around environmental sustainability like you would like them to have, so the question is what can industry do to maybe change that or build in sustainability into that process." - P4.

A similar story emerges in the automotive sector. What we find in the case of the Automobile Manufacturer is that sustainability innovation is solely driven by the needs of the regulator - without any consideration for the market need or the financial viability of the initiative.

"one goal [for undertaking sustainability innovation is] surely about staying legally compliant…meaning if in the years 2020, 2025 in Europe and the United States there will be more stringent emission requirements, then electro-mobility must contribute a significant amount in order to enable [automobile] with its significantly larger cars in the fleet like the [medium range] and [larger range] vehicles to achieve the [minimum legal] emission levels" – A2.

"…the [ultimate] goal is to stay act compliant without paying any penalties" - A2.

The Auto Manufacturer's ultimate goal is not driving sustainability innovation around the needs of the customer but to meet the technical and legal requirements of the regulators at the expense of the customer. The manufacturer wishes to demonstrate willingness to aspire to the regulatory targets in the hope that they can influence future policy surrounding sustainability innovations as well as set future standards in the industry. Once again we can see evidence regarding the conflicting objectives of the regulators based on the quote right at the top of this results section about the cost of meeting the carbon emissions regulations expected for the future.

In fact the Auto Manufacturer perceives the customer as adapting to incremental future technology that meets the requirement of regulators rather than designing the technology around the customer, which is exemplified by the following statement:

"You just have to ensure that the customer can grow with the technology… and that the vehicle architecture is able to grow with new technologies, especially in the area of batteries. The car is able to grow." – A4.

DISCUSSION

We started out with the aim or exploring the process of sustainable innovation to gain a better understanding of why sustainable innovations can be slow to diffuse and have a high rate of failure. In particular we took a network orientated view on the basis that both sustainability and innovation are seen as network phenomena involving multiple different stakeholders in decision processes. However our contribution suggests there could well be failure on behalf of manufacturers to take a stakeholder orientated approach to sustainable innovations. Both our case companies (and also our Pharma customer) approach standard innovations in a very customer orientated or co-created way. Waste Management Co. and Pharma Co. in particular are heavily involved in the modern era co-creative approaches to innovation. These are suggested to lead to more advanced innovation (Hatch and Schultz, 2010; Homburg et al., 2008; Ballantyne and Varey 2008), more marketable and faster rates of innovation (Zwass, 2010; Fuller, 2010; Mattsson, 2010; Marandi *et al.*, 2010); emotional attachment on behalf of customers (Andersson and Hultman, 2010; Jaworski and Kohli 2006; Prahalad and Ramaswamy, 2004) and better brand image (Metz *et al.*, 2009; Bowonder *et al.*, 2010; Hatch and Schultz, 2010), thus accelerating both development and diffusion of innovation. However when it comes to sustainable innovations our companies revert to an old style production

orientated approach to sustainability ('what we can make?' not 'would a customer want to buy it?'). By definition this form of innovation is less palatable, largely less successful and in our cases in particular - not really that marketable. It appears markedly at odds with everything we know about both innovation and sustainability that companies should have such a different approach to sustainable innovation. What we find is that both companies are practicing what Hassi *et al*. (2009) describe as "reducing unsustainability" involving only incremental changes likely to have a small impact on "single line businesses". This is not the same as firms focussing on "creating sustainability". Sustainability creation as opposed to "reducing unsustainability" requires companies to focus on radical change of their business model involving making changes that are likely to impact on the three cornerstones of sustainability namely the triple bottom line; Economic, Social and Environmental Considerations (Elkington, 1997). The cases researched in this study are not unusual in their approach to sustainability as Elkington in Ghosh (2013) point out that most organisations have failed to understand exactly what sustainability is all about. The companies are using the language of sustainability due to peer pressure and doing more than they did twenty years ago, but they are focussing mainly on efficiency and transparency issues relating to their supply chains and failing to understand the wider social and environmental issues - such as Automotives "sustainable innovation" leading to double consumption in e-car customers through having to buy both the e-car and a standard car.

There is however issues which drive this production orientated approach. For instance the economic imperatives of both manufacturers and customers suggest sustainable innovations may never see market launch because on the triple bottom line, economic is still king. Admittedly using a more co-creative approach has been shown to lead to customers willing to pay more for innovations and could overcome this obstacle, but at present this is seen in the case studies as an obstacle.

Both manufacturers and the customers perceive the customer to be unknowledgeable about sustainability and therefore unable to partake in innovation. However once again co-creation should point towards more usable innovations - even if customers don't have the technical knowledge about sustainability, they know how they use products and services to solve problems and it is this knowledge most commonly utilised in co-creation activities.

We also see a major obstacle in governments sending conflicting messages about sustainability. One regulator pushes for greater sustainability - and mandates innovation as with low emission cars in the EU, but does not consider the customers willingness or interest in the vehicles, or the relative sustainability of the technology. There have even been questions raised about the relative sustainability of Hybrid and Electric cars vs. combustion engine without fundamental shifts in electricity production (Bradley and Frank, 2009; Samaras and Miesterling, 2008), yet economic concerns within Europe for the past 5 years have seen green energy initiative cut back. One decision is therefore detrimental to the effectiveness of the other. Similarly in the Pharmaceuticals industry the regulation put in place to make introduction of new technologies consumer safe, presents an ever present barrier to the development of new less proven technologies - which all sustainable innovations will be.

Ultimately however the question arises as to whether sustainable innovation in market leading companies is actually aimed at leading to a more sustainable world. In terms of market position both case companies (and Pharma Co.) can be viewed as market leaders with the most to lose should a shift to sustainable alternatives occur. In all three instances regulators are seen as a risk which must be mitigated, not sustainability a problem which

must be solved or sustainable consumers a market which should be tapped. In the case of the e-car there appears to be little interest in it being a commercial success, it is a means to a regulatory end. And for both Phrama and Waste Management Co. sustainable innovation is a cost benefit analysis in terms of economic imperatives, not a lifecycle cost benefit analysis.

On the positive side, the outcome of this research has actually been that Waste Management Co. realised its lack of relational approach when it came to sustainable innovation and has now set up an Innovation Hub for engaging with customers on sustainable innovations.

In conclusion our data suggests that traditional product orientated models of product and process development are being used as opposed to newer marketing orientated frameworks such as the ARA interactional – networked models in the development of sustainability innovations. End consumers and other B2B customers play a limited role in the co-development of new products and processes. It also suggests that sustainability innovation processes are also different to the process of non-sustainability innovations where it is believed that interactional involvement of customers take place in relational networks. The reason for the non-involvement of customers in the development is believed to be that organisations want to meet the requirements of regulators as opposed to the needs of customers.

RECOMMENDATIONS FOR FUTURE RESEARCH

Additional sustainability innovations case studies are recommended to be undertaken across different industries to verify whether similar findings are identified. It also recommended that comparative studies of how sustainability innovation development and traditional innovation development are undertaken within organisations.

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