AN EXPLORATIVE STUDY FOR BUSINESS MODELS FOR SUSTAINABILITY

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Abstract

Sustainability now becomes one of the key issues in innovating existing environments, where we live, and behaviours of people, how we live. There have been a lot of new attempts and initiatives for promoting the sustainability by government, industries, and communities. However, for the survival and successful adoption of the innovative efforts to real world, they need to be institutionalized or established as stable formal/informal institutions or business models. Especially, the efforts in private sectors, incumbents or entrepreneurs, should develop and find out, even through trial and errors, a viable business model for the sustainability. This paper reviews the various initiatives from the business model perspective, analyze the characteristics of the sustainability business models and suggest key dimensions to design new business models for sustainability.

Keywords: Business Model, Sustainability, Green Business, Green IT.

1 APPROACHES TO SUSTAINABILITY

The efforts for sustainability have been discussed mainly in terms of technology or a specific industry (Letcher 2008, Pernick & Wilder 2007, Asplund 2008). Most researches have suggested new technologies, scenarios (Mitchell & Casalegno 2008), or prototypes on sustainability, but not been clear about the ultimate way of diffusing the developments to the world. Most of policy researchers have discussed the sustainability initiatives in terms of an industry or a technology area. This paper proposes a new unit of discussion and analysis for sustainability initiatives: business model.

The recent pursuit for sustainability in businesses, policies, and researches can be regarded as emphasizing the human value dimensions such as 'being in tune with nature', 'Preserving the environment', and 'Social responsibility' if we employ the fifty seven kinds of human values, which were introduced by Chow & Amir (2006). Interestingly, such sustainability-concerned values are not found in the earlier research on human values by Rokeach (1973) or Schwartz (1994). As such, sustainability is a relatively new value pursued by human beings. However, sustainability now becomes one of the key issues in innovating existing environments, where we live, and behaviours of people, how we live.

Sustainability is approached by various ways. In some industry, sustainability is just concerned about how we make products. For example, Interface Inc., a leading company in design, production and sales of environmentally-responsible modular carpet, is a representative case of sustainability-concerned manufacturer. Others include Mars Inc (Mars.com) for chocolate, confectionery and beverage, Patagonia (Patagonia.com) for outdoor clothing and gears, Seventh Generation (SeventhGeneration.com) for green cleaners and papers. For the more comprehensive list, refer to Choi , Gray, and Carroll (2008).

However, sustainability cannot be successfully addressed only with production and manufacturing approach. It should be approached also from consumption side. SCORE! (Sustainable Consumption Research Exchanges) is an EU funded network project (Tukker et al. 2006) that supports the UN's 10 Year Framework of Programs on Sustainable Consumption and Production (SCP). The SCORE! philosophy assumes that sustainable consumption and production structures can only be realized if experts that understand business development, (sustainable) solution design, consumer behaviour and system innovation policy work together in shaping them. Furthermore, this should be linked with experiences of actors (industry, consumer groups, eco-labeling organizations) in real-life consumption areas. Munns (2008) claims that, in the area of electric energy efficiency, the challenge is to discover the combination of business models and policy constructs that will enable energy efficiency to reward customers and suggests four emerging incentive methods such as shared savings model, bonus ROE (Return on Equity), ESCO (energy service company) model, and virtual power plant.

Sustainability has been also studied from PSS (Product Service System) approach. The Product Service System (PSS) concept is understood as a cleaner product concept developed to achieve improvements in resource productivity which may be realized in service delivery (Gottberg, Longhurst, & Cook 2009). Although the term PSS has no words for sustainability and understood only to comprise tangible artefacts (goods) and intangible services which are conflated through design processes so that they are jointly capable of fulfilling specific customers needs (Manzini & Vezzoli 2003), the PSS have been much related to sustainability since its inception (Goedkoop et al. 1999; White, Stoughton, & Feng 1999; Hockerts 1999; Schrader 1999).

One of important concept understanding sustainability initiatives is system innovation (Elzen, Geels, and Green 2004). Although the work did not use the term business model, it can be thought as supporting business model approach for sustainability since the term system innovation means the changes in Socio-Technical Systems. Berchicci (2009)'s work describes the case study on innovation of personal mobility for sustainability. Elzen, Geels, and Green (2004)'s concept of system innovation for sustainability is more broad concept than that of Berchicci (2009). However, both works are not based on the concept of business model.

2 BUSINESS MODEL APPROACHES TO SUSTAINABILITY

A model is not just a camera, but can be an engine (MacKenzie 2006). Economic models can shape the real economic world (Callon 1998) as option models for financial markets. Therefore, the efforts of establishing desirable business models will affect the real world implementation of businesses. The concept of business model suggests a systematic way of designing and analyzing new business initiatives, especially technology-based business initiatives. A business model of a technology company is the construct that mediates the value creation process between the technical and economic domains, selecting and filtering technologies and packaging them into particular configurations to be offered to the market (Chesbrough and Rosenbloom 2002).

Since the earliest definition on business model by Timmers (1998), there have been many ongoing attempts to define business models in business literature such as Mahadevan (2000), Amit and Zott (2001), Shafer, Smith, & Linder (2005), Morrisa, Schindehutteb, & Allenc (2005), and Osterwalder, Pigneur, & Tucci (2005). In a most recent attempt to define business model (Christensen, Johnson, & Kagermann 2008), the business model is defined as having four interlocking elements that, taken together, create and deliver value: 1) Customer Value Proposition, 2) Profit Formula, 3) Key Resources, and 4) Key Processes.

If we take a minimalist approach to define the elements of business models, we can find the four submodels: 1) Value Model, 2) Stakeholder Model, 3) Process Model, and 4) Financial Model. Paraphrasing a statement from Magretta (2002), the business model tells a logical story explaining who your stakeholders are (Stakeholder Model), what they value (Value Model), and how you'll make money (Financial Model) providing them that value (Process Model).

With respect to the value model, the first element of a business model, the sustainability business models are interpreted to have the value models which propose the values ‘being in tune with nature’, ‘Preserving the environment’, and ‘Social responsibility’ among the various values as its core values, as discussed in the introduction section. Pater (2006) proposes a framework for evaluating the total value proposition of clean technologies describing the virtual, physical, and non-traditional financial values of the technologies based on their associated value chains. This paper does not review or explain how to develop and evaluate a business model in detail. For the cases of developing business models in ubiquitous computing area, refer to Lee & Seo (2006), Lee & Lee (2006), and Lee, Jeong, & Ju (2006).

Nidumolu, Prahalad, & Rangaswami (2009) claims that only companies that make sustainability a goal, by rethinking business models as well as products, technologies, and processes, will achieve competitive advantage. In real business environment, the lack or absence of satisfactory business models is reported as one of the key barriers to green innovation (Charter and Clark 2007; Keeble et al. 2005). Stubbs and Cocklin (2008) proposes a comprehensive framework for environmentally sustainable business model. However, it focused on single firm’s corporate sustainability, rather than multi-firms and industry perspective, that is, system sustainability. They deal with the sustainability business model from an incremental improvement efforts rather than innovation. Although the research uses the term ‘business model’ in its title and content, but it is not based on the state-of-the art academic literature on business model. Wüstenhagen and Boehnke (2006) is one of early researches approaching the sustainability from business model perspective. It summarizes the challenges in commercializing sustainable technologies as 1) environmental externalities, 2) capital intensity and long lead-times, and 3) the power of incumbents. It claims that, by appropriately designing the elements of a business model, a firm can tune its offerings to meet the three challenges and therefore achieve higher market penetration of these technologies as well as commercial success at the firm level.

3 EXPLORING THE CHARACTERISTICS OF BUSINESS MODELS FOR SUSTAINABILITY

3.1 Classification of Sustainability Initiatives

For understanding business models in an area or an industry, an activity of classifying business models in the area is necessary as Timmers (1998) in electronic commerce, MacInnes & Moneta (2002) in mobile games, and Fisken & Rutherford (2002) in biotech industry etc. Timmers (1998) suggests a systematic approach to identifying architectures for business models based on value chain de-construction and re-construction, that is, by identifying value chain elements, and identifying possible ways of integrating information along the chain. Timmers (1998) proposes a qualitative mapping of the eleven Internet business models along two dimensions: 1) the degree of innovation and 2) the extent of integration of functions.

Hordern, Börjesson & Elmquist (2008) classifies so-called green innovation initiatives to be (1) a 'reduction' of environmental impact, (2) the 'introduction/creation' of environmental performance, and (3) the 'improvement' of environmental performance. Among the three, the second one, 'introduction/creation' of environmental performance, especially needs to consider its business model seriously for its own sustainability as a new being. Therefore, this paper focuses on the second one rather than the first or third one, the initiatives dealing with a 'reduction' of environmental impact or the 'improvement' of environmental performance.

Similar typology is also found in Elzen, Geels, Hofman and Green (2004) for analyzing the transitions to sustainable personal mobility, which distinguishes two general patterns in transitions: technical substitution and broad transformation. In the substitution route, the existing regime is relatively stable while radical innovations are developed in niches, while the regime starts to change in an earlier stage in the transformation route (Geels 2002). For example, HEV (hybrid electric vehicle) is a typical example of technical substitution, and Smart Grid and Distributed Generation (Sauter & Bauknecht 2009) are closer to transformation than substitution. Gore (2009) says the technologies necessary to build a super grid are fully developed and available now and the only missing ingredient is political will. However, another missing ingredient, in our view, is business model.

Most of business model-concerned sustainability initiatives will belong to the category of the 'introduction/creation' of environmental performance according to Hordern, Börjesson & Elmquist (2008)'s scheme and 'transformation' according to Elzen, Geels, Hofman and Green (2004).

3.2 Sustainability Business Models vs. Internet Business Models

The recent investment boom on "Green" and "Sustainable" ventures (Wüstenhagen and Teppo 2006) reminds us the investment rush to Internet startups in late 1990s. Lessons should be learned from the experience and it is interesting to note the similarities and differences between the Internet businesses and the sustainability initiatives.

Sustainability initiatives have common characteristics with those of Internet businesses, which are summarized as follows. In both area, business models have emerged from new and distributed sources of powers (for sustainability) or contents (for Internet businesses), that is, prosumers. Both business models try to utilize a new possibility from the new interconnection networking between producers and consumers and between consumers. Both areas have the similar risk of revenue cannibalization to incumbents and suffer from the uncertainty of business models.

However, there also exist important differences. Sustainability initiatives require more intensive technology therefore more upfront cost, which may make the "start-up" approaches inefficient. The natures of the businesses are much more complex and more interconnected among businesses. In addition, due to the geological differences in each country and region, there is a possibility of regionalism emerging thus more international collaboration is needed (Weiss & Bonvillian 2009)

Green technology is not a single technology but a vast and complex array of technologies that pervade the entire economy on both the supply side and demand side (Weiss & Bonvillian 2009). EV

manufacturer's business models are interrelated with the business models for public charging infrastructure. In addition, both business models are interconnected to Smart Grid business models. Especially, the interconnection between EV and utilities is called V2G such as Vehicle Fleet-Grid Interaction Model and Vehicle-to-Grid (V2G) Model (Quinn, Zimmerle, & Bradley 2010). In addition, Smart grid architecture and diffusion will interact the photovoltaic technology and the business models (Graham et al.2008). The interconnectedness of sustainability initiatives implies the importance of business model-based design and analysis and especially the importance in deciding the stakeholder model and the resulting value model. Stakeholders in a sustainability initiative may include a variety of participants such as IP owners, technology distributors, property owner, generator, distributor, end user, investors, shareholders, insurance companies, and society (Pater 2006). A value model of a sustainability initiative should fit to the value model of another initiative. Several networks of inter-fitting business models can co-exist in an eco system. Wells (2006) also pointed out that the there would be no one single dominant business model but several coexisting in the domain of business models for a sustainable automotive industry.

4 KEY DIMENSIONS FOR AND DESIGNING SUSTAINABILITY BUSINESS MODELS

We explore the key dimensions to design the business models for sustainability based on literature review and case analyses. As a result, we suggest the three dimensions as follows: 1) Product Service Spectrum, 2) Ownership Structure, and 3) Central-Decentralization Mix.

4.1 Product Service Spectrum

The first key dimension is product-service spectrum. For explaining the product-service spectrum, the sustainable transportation is used as an example in this section.

Sustainable transportation initiatives consist of electric vehicles, energy storage (Ebrahim & Zhang 2008), electric vehicle network, and electric vehicle infrastructure. Electric vehicles include PEV (Plug-in electric vehicles), HEV (hybrid electric vehicle), PHEV (Plug-in hybrid electric vehicle), FCV(Fuel Cell Vehicle), and OLEV (On-Line Electric Vehicle, Suh, Cho, & Rim 2010)). An electric vehicle network is an infrastructure system of publicly accessible battery recharge stations and possibly battery switching stations. There have been ten more electric vehicle infrastructure manufacturers (Delta Energy & Environment 2009) and most of them do not include battery swap stations as of 2009.

On the other hand, so-called Electric Recharge Grid Operator (ERGO) such as Better Place (http://www.betterplace.com) creates a system for consumers to subscribe to a service that offers recharging stations and battery exchange. Better Place plans to include battery switching, or swapping, stations in their network which will allow drivers to quickly exchange an electric vehicle's discharged battery pack for a fully charged pack. In Better Place's business model, the battery pack is owned by the network operator who then bills the electric vehicle owner for use of the battery based on distance traveled (wapedia.mobi/en/Electric_vehicle_network).

Going further from charging or swapping model, on-Line charging model has been developed. KAIST (Korea Advanced Institute of Science and Technology) has developed so-called On-Line Electric Vehicle (OLEV), which is an experimental alternative where vehicles will be driven with power transferred by magnetic induction from cables buried underground (Moon 2009).

The variety of business models in sustainable transportation comes from the wideness of the product-service spectrum of the value model of businesses in the area. EV manufacturers should consider the service value proposition of themselves to the customers. The energy storage providers should also consider the possibility of their own service model because one of the important barriers to EV adoption is the efforts and time for charging the batteries. Every business participant in sustainable transportation should keep in mind that the third foundational premise of so-called service-dominant logic (Vargo & Akaka 2009) – "Goods are distribution mechanisms for service provision".

The considerate mix of product-service in the value model of a sustainability business model will be a very important, repetitive, and evolutionary step in designing the business model. Business modelling is the managerial equivalent of the scientific method - starting with a hypothesis, which is then tested in action and revised when necessary (Magretta 2002). The value model will be developed simultaneously with the stakeholder model, the process model, and the financial model. Considering the wide spectrum of product-service is also related to the expanding the revenue source of the initiative by creating a new market space 'blue ocean' without head-to-head competition (Kim & Mauborgne 2005). Frost & Sullivan (2009) reports that EVs will be sold through new channels such as subscription-based energy packages to offset the initial high cost of lithium-ion batteries and an innovative enterprise, so-called integrator, that forms the single business interface managing diverse services delivered to the EV consumer. The innovation lies in offsetting the high initial EV cost by clubbing after-sales services as a subscription energy package. Interestingly, the report concludes that the revenue generating opportunities are mainly outside selling energy.

4.2 Ownership Structure

The second key dimension is ownership structure. The ownership and governance in business model, that is, "who owns what", is one of the core features of business model. Amit and Zott (2001) propose the governance of the transaction as one of the three components of business model as well as the contents and structures of the transaction.

Frantzis et al. (2008) claims that who owns and controls the PV facilities and the related flows of cash and other benefits is key to determining the potential viability of any PV business model. Graham et al. (2008)'s classification of the photovoltaic (PV) business models related to Smart Grid is also based on the ownership structure as follows: 1) Third Party/Customer Controlled and Owned PV Business Model, 2) Utility Controlled, But Third Party or Customer Owned PV Business Model, and 3) Utility Controlled and Owned PV Business Model. EPRI (2008) also classifies the DER (Distributed energy resources) business models in action in Massachusetts, USA based on the ownership as follows: 1) Customer-owned, utility-facilitated distributed energy resources, 2) Utility ownership of solar photovoltaic generating facilities, and 3) Utility enhancement of distribution infrastructure to enable DER. As seen in the preceding section, the business models for public charging infrastructure in EV are also differentiated by the ownership of the batteries.

Deigning a business model for sustainability is to design or find a desirable ownership structure and governance, that is, an institution, which will create new values efficiently and deliver them to stakeholders efficiently.

4.3 Central-Decentralization Mix

The third eye to view a sustainability business model is mix of centralization and decentralization in the sustainability initiatives. Virtual data centers and cloud computing in so-called Green IT initiatives place an emphasis on more centralization. In such areas, sustainability or energy efficiency is pursued by centralizing the computing powers and resources rather than the decentralization. On the other hand, distributed PV (Bradford 2006) and wind power initiatives contribute more decentralized electricity generation (Alanne & Saaria 2006). Smart Grid has both directions. Smart Grid assumes the decentralization of power sources, but also may need more centralized coordination among the interconnected power prosumers.

Decentralization has played as rhetoric in real world businesses and literature. For example, there have been many promising attempts to decentralize Internet business models from client-server architecture to peer-to-peer architecture (Oram 2001, Kim, Lee, & Kim 2006, Lee 2001), but most of them failed. Especially pure peer-to-peer architectures like Gnutella have not been installed as a stable business model or institution. The survived hybrid peer-to-peer business models such as those of Napster.com and Skype.com give a lesson that the decentralization should come with a coordination mechanism.

5 IMPLICATIONS AND CONCLUSIONS

The analysis of the characteristics of sustainability initiatives and extraction of their key dimensions give us a view to business model for sustainability. Business models for sustainability cannot be fully described just by the terms such as transition, transformation, path dependency or system innovation. In our view, building a sustainable society is the same as finding a set of viable business models for sustainability. In Internet business area, through the trials and errors of numerous Internet start-ups, the business models such as keyword search advertising (e.g. AdWords of Google.com) based on the business method patent of GoTo.com (1999), content match advertising (e.g. AdSense of Google.com), and open market business models (e.g. eBay.com and Apple's AppStore) have survived as viable business models and stable institutions of the market.

In sustainability area, the individual entrepreneurs need to devise and evolve their business models considering the dimensions explained in this paper such as product service spectrum, ownership structure, and centralization-decentralization mix. However, due to the interconnectedness between sustainability initiatives, the business models compete and cooperate each other simultaneously and the success of a business model for sustainability depends not only on the its own performance level but also the successes of other related business models and the acceptance of changes by consumers.

The high uncertainty about the success of a business model will constrain the willingness of entrepreneurs and the potentials of investment. To improve the visibility of viable the business models, academic researchers and policy makers need to exert more efforts to find the promising set of the interconnected business models. However, existing technology and industry-focused researches and policies do not deal with the interrelationship between industries and between technologies. But new discussions based on internetworked business model perspective will provide a new insight to policymaking.

Future researches on the business models and policies for sustainability can include the efforts for finding the feasible set of sustainability business models in advance to minimize the trial and errors by entrepreneurs. We can consider a parallel simulation of business model combinations based on evolution mechanism for finding contingent series of policy action. The variables including the key dimensions in this paper can be used for simulation, which may use techniques such as genetic algorithm. The genetic evolution simulation of the business model fit emergence from the combinations of multi-dimensional business models may be suggested as a future research to give insights to the business model designers and policy makers.

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