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RESEARCH QUESTION

How can business models be adapted such that processes incorporate the concept of the Triple Bottom Line (TBL)?

What features of such business models / business processes will contribute to the success of renewable technologies for household markets?

OBJECTIVES

To take an objective look at renewable technologies for household markets and to develop innovative business models for these markets to ensure that their processes and outcomes are economically, socially and environmentally viable.

The main aim of any organization that is looking to develop innovative renewable technologies should be to extract economic, social and environmental value (TBL). The perception of the value of renewable technology to customers however varies from the perceived value to investors, the government, the society and other stakeholders. Business models must demonstrate viability across all the elements of value of the TBL. They must illustrate to each stakeholder the importance of the other elements of value as defined by other stakeholders and must be capable of adapting to changing trends and perceptions of value. The value proposition of the business model(s) that will be developed in this research will therefore be defined in terms of the triple bottom line, which places sustainability at the center of the model.

LITERATURE REVIEW

Fluctuating prices, controversial and insecure supplies, limited reserves and emissions associated with crude oil have all encouraged research into renewable energy technologies over the past couple of decades. The peak prices of crude oil in 2008 also awakened the realization of depleting oil reserves and unsustainable supply. The modular nature of renewable technologies reduces or eliminates the cost of certain production and distribution infrastructure such as long pipelines and large scale power plants (US DOE 1997). At the same time, this non-continuous nature of the fuels may also require costly solutions for achieving integration into an electricity grid for power distribution (APEC 2009). This has strengthened the link between sustainability and profitability not only because of the reduced environmental and social risks, but also due to reduced infrastructural, raw material and storage costs.

Renewable resources have a huge potential since they are mostly readily available; some of the popular ones include solar, wind, tidal, biomass, geothermal and hydro. The raw materials are easily accessible even though seasonal climates may sometimes determine the types and quantities that can be harnessed at a particular time.

A few countries have been able to commercialize renewable technologies including Germany, Spain, Japan, Italy, USA, UK, Czech Republic, France, China, Belgium and South Korea. Germany, which is currently the world leader in renewable energy, has created over 300,000 green jobs and in 2009, renewable energy contributed about 16.1% to their total electricity consumption (Yee and Han, 2011). The UK government has shown no less commitment to the development of renewable technologies and they have come up with a roadmap to stir them towards delivering 15% of the UK's energy consumption through renewable energy by 2020 (DECC, 2011).

Business models are largely impacted by the regulatory framework within which they are expected to work and research has shown that some of these regulations are more effective and efficient (APEC 2009). Some of the renewable energy policies that have been enacted till date include Feed-in-Tariff (FiT), Renewable Portfolio Standards (RPS) or Renewable Energy Standards (RES), and Net Metering (Yee and Han, 2011). The FiT scheme is a financial incentive offered to individuals and businesses that generate renewable energy (Cory 2009). The financial benefits may accrue based on the amount of electricity generated for personal consumption or for export to the grid. The RPS assigns a minimum percentage to electricity retailers that must be provided from renewable energy sources while net metering allows a customer's meter to run backwards when more electricity than consumed is generated (Cory 2007, APEC 2009). The FiT seems to be the most prevalent and effective one as over 40 countries have adopted this policy including Germany and Spain who have recorded significant success in their renewable energy markets (Grace 2008, Stern 2006). Other financial incentives that may have an effect on the business model include tax benefits, grants, rebates and loans provided by the government (APEC 2009).

Successful business models must have clear value propositions, a unique selling point, must be realistic and hard to replicate. This implies that they must be capable of meeting genuine customer needs, must be achievable, must align with overall business strategies, must be capable of adapting to changing business environments and must demonstrate genuine TBL value. These characteristics must be clearly and creatively communicated with investors, customers and other stakeholders in order to effectively compete in existing and emerging markets. The business model must not only highlight the inputs, processes and outputs, but must also take a holistic approach by considering the total life cycle management of the technology.

The concept of the triple bottom line, which was coined by John Elkington in 1994, has been widely used by energy companies including Shell [Elkington, 2004]. The concept was born out of a need to address environmental progress in a more integrated way that would include people (Social) Profits (Economic) and Planet (Environment). In the same publication Elkington also reinforces the fact that for companies to be sustainable, their business models and technologies must also

be sustainable in the long run. Sustainability must therefore be at the core of renewable technologies and it is pertinent to ensure the effectiveness of renewable technologies through the use of innovative business and operational processes throughout the lifecycle of the product.

CONTRIBUTION

This research seeks to understand the position of various stakeholders relative to the environmental, social and economic importance of renewable technologies. The following stakeholders have been identified:

- Customers
- Government
- Shareholders
- Investors
- Business Owners
- Employees
- Suppliers
- Local Community
- Partners
- Insurers

The prioritization matrix below shows how each stakeholder prioritizes each of the elements of the triple bottom line. Please note that the figures shown here are only speculative and actual values will be collected based on interview feedbacks obtained from various stakeholders.

	Environment	Economic	Social
Customers	2	3	1
Government	3	2	1
Shareholders	1	3	2
Investors	1	3	2
Businesses	1	3	2
Employees	3	1	2
Suppliers	2	3	1
Local Community	3	1	2
Partners	3	1	2
Insurers	1	3	2

Table 1: Stakeholders Prioritization Matrix

Key: - 3 = High, 2 = Medium, 1 = Low

This matrix was developed by me during an in-module presentation for "Design for the Environment" during my MSc at the Warwick Manufacturing Group. Please note that this has not been published.

The business model below was developed based on existing models that have been analyzed in case studies including those cited in the APEC 2009 publication. It attempts to consolidate different notions of successful renewable technology processes and use this as a springboard towards developing a credible and innovative business model. Classifying the inputs and outputs in terms of economic, social and environmental parameters presents a value proposition consistent with the triple bottom line.



Figure 1: Test Business Model for Renewable Technologies Using Sustainability Measures of the TBL (Economic, Social and Environmental) as Measures of Value

This model is by no means exhaustive but is an attempt to demonstrate the work that has been done so far by me in this area and to show the parameters that would be potentially captured in an innovative business model. The hexagon represents the business processes including production, distribution, storage, management and operational expenses. These processes can be further expanded if technical details of the processes are required for a particular renewable technology. The outputs of a process are only as good as the quality of the inputs and the effectiveness of the processes and these would be further elaborated during the research. According to Dwight D. Eisenhower, "plans are useless but planning is indispensable" hence, this business model should be considered a statement of intention that would facilitate combating and adaptation to future challenges.

Several value propositions can be weaned out of this generic model and companies can identify their unique selling propositions depending on the technology in which they specialize. Take the solar technology for instance; a San Francisco based company called SunRun formed a strategic alliance with a solar technology company that specializes in the design, construction and installation of photovoltaic power systems. This strategic alliance causes SunRun to enjoy bulk purchase discounts from such major equipment manufacturers. SunRun also partnered with a bank to secure project funding as well as for collateral purposes. Power Purchase Agreements with residential customers ensures customer commitment and increases their confidence in the company's offerings of cheaper electricity (more than 50% cheaper than existing utility costs), clean and sustainable energy source, minimum liability equipment installation and utility credit incentives for households that produce more than they need (APEC 2009). In this case, SunRun's value proposition is the security of supply at low costs that each customer will derive based on their long-term purchase agreements which translate as a secure market for their business. On the other hand, strategic alliances with the equipment manufacturers also assure SunRun of secure supply of equipment and on the part of the suppliers, a secure source of revenue too.

Other models and matrixes will be developed in the course of this research based on the data collected and analysis made.

RESEARCH TECHNIQUES

Existing business models that have been adopted in some regions including the US, UK, Germany and Asia will be studied / analysed and these will be used as case studies in the course of this research. The successful elements of these existing initiatives will be harnessed towards developing practical and profitable technology and business models for renewable technology household markets.

A significant amount of research into renewable energy has been done by the public sector including the UK Department of Energy and Climate (DECC), United States Department of Energy (DOE), US National Renewable Energy Laboratory (NREL), Asia-Pacific Energy Economic Cooperation (APEC) and the International Energy Agency (IEA). These entities are custodians of administrative and statistical information on the progress and status of renewable technologies over the years and the programs that have been developed to support and secure renewable technology. Data collected from their database will include past and current expenditures, research funding, budgets and roadmaps. Statistical information on percentage of renewables in the total energy supply, calculations of avoided emissions of greenhouse gases, gross production of renewable energy, gross consumption of renewable energy, most effective and efficient renewable energy sources, impact on employment and economic improvements will serve as good benchmarks against which successful business models can be built.

Asides parastatals, companies such as Natural Power Group and RES Offshore who have consulted for and managed several renewable energy projects will be good sources of data for business models that have been successfully implemented till date.

There is also a need to identify the major stakeholders and use a matrix to conduct a stakeholder analysis under each classification of the TBL i.e. environment, economic and social. This is necessary because, as earlier stated, the value of any renewable technology is always relative to the stakeholder since the perception of value for different stakeholders vary. Interviews or questionnaires will be used to record the perceptions of each stakeholder classification with respect to the people, profits and the environment. Matrixes can also be used to identify the relationship between specific business processes and the triple bottom line as a form of value weighting for the processes.

CONCLUSION

Traditionally, the success of a business model is mainly defined by its financial / economic returns and a shift towards the inclusion of environmental and social values is being proposed. This research will take a holistic approach towards defining and developing business models for renewable technologies in household markets by incorporating it into core business strategies in alignment with the triple bottom line. The research methodologies that would be employed here will therefore be mainly qualitative with occasional quantitative analysis based on statistical and interview data. Results will empower businesses to develop operations and technologies that can be carried out responsibly and profitably without compromising the bottom line whilst being able to accommodate and adapt to changing business environments and stakeholder requirements. Companies that have existing energy initiatives will also be offered recommendations as to how they can tackle the deployment of renewable technologies from the position of their competency and consider it a source of opportunity, innovation, and competitive advantage.

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I have a BSc in Chemical Engineering and an MSc in Process Technology and Business Management. My interest in sustainability and alternative energies began when I started writing my MSc dissertation on Cost Reduction Strategies for Natural Gas Fuelled Solid Oxide Fuel Cells. I had identified at this time that the demand pressure on fossil fuels allied to depleting oil reserves will create the need to look to other sources of energy with more reliable supplies. Also, the need for energy companies to adopt more environmentally friendly operations had been identified due to increasing environmental pollution and climate change. The Stern report on climate change which was studied during my Design for the Environment module as well as my post-module work on Biomimicry also contributed to my curiosity about alternative and renewable technologies. As a Project Engineer at Oando Plc., I have written project manuals that have been adopted throughout the company with minimum supervision and this goes on to demonstrate my ability to complete a research paper worthy of publication. I have excellent presentation skills and I have the ability of presenting complex information in more simplified and visual ways. My research into Innovation and Renewable Technologies will therefore draw from these past experiences and academic acquaintance to develop a business model that would look past the traditional financial objectives of most businesses and encourage a paradigm shift towards business models that are consistent with the triple bottom line (Social, Economic and Environmental elements). The triple bottom line has been defined as a measure for sustainability by John Elkington and my research aims to view renewable technologies of household markets from this holistic standpoint. I look forward to making academic and business recommendations that would have a positive impact on the way renewable technology operations and projects are implemented.