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2013/64/TOM

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Plambeck (Forthcoming) describes five "Cleantech" firms (Zeta, First Solar, Better Place, Amyris and Calera) and calls for guidelines on how the Operations Management community can stimulate invention of new business models that promote environmental sustainability. The need to systematize the study of business model innovation is central to the creation of sustainable businesses. A new business model can often make the ownership and use of existing products/technology more environmentally and socially favorable. For instance, business models that align incentives of users with the environmental impact of their use can make existing products and technologies more sustainable. Further, just as in previous disruptive technological advances like the Internet, the advancement of sustainable technology has often exceeded the development of business models needed to capture value from it (Teece 2010). Specifically, the innovative technology offerings of some Cleantech firms often come with economic characteristics (scale-cost functions, risk profiles, cash flow profiles, etc.) that are drastically different from the traditional technologies that they substitute. Thus, these firms must pair their innovative technology offerings with business models that facilitate commercialization, adoption and scaling of these innovative technologies. This article provides a brief summary of a conceptual framework that we have developed to study and cultivate new business models, as applied to understanding and developing business models for sustainable firms. The ideas presented in this manuscript are elaborated in our forthcoming book (Girotra and Netessine 2014) and the interested reader can find details of the illustrative examples in the associated references.

1. Innovating Business Models

What is a business model? There is no general agreement on the answer to this seemingly simple question and Teece (2010) states directly that "… the concept of business model has no established theoretical grounding in economics or in business studies". A widely used definition says "A business model describes the rationale of how an organization creates, delivers, and captures value (economic, social, or other forms of value)" (Kaplan 2012). Academics have tried to further break down business models of firms into pieces such as the Profit Formulae, Processes, The Value Proposition and Resources (Johnson et al. 2008), Activities (Amit and Zott 2012) and the Business Model Canvas which proposes a 9-part analysis covering organizational activities, partners, value proposition, channels, resources, etc. (Osterwalder and Pigneur 2010). Each of these definitions is

intimately related to the way the organization produces and delivers value to customers, a central focus of the operations management community. In fact, one way to define a business model would be as the operating model of a company or as the product/service delivery system. Despite the centrality of operations to the design and analysis of business models, the topic of business model innovation is largely absent from discourse in the operations management community, with perhaps the exception of work on operational innovation by (Hammer, 2004), which describes the role of process re-engineering in achieving breakthrough cost-reduction or process efficiency improvements. Missing from these perspectives on business models is the role of decisions, risks, uncertainty and incentives—all central topics in recent operations management research—in driving (or holding back) business model performance.

Consider three celebrated examples of business model innovation: Dell's production to order system, Zara's supply chain for fast fashion and the Toyota Production System. In each of these examples, the firms disrupted the traditional way of doing business not through introduction of new technology or through creation of new products or through finding new market niches, but by identifying novel ways of delivering existing products based on existing technology to existing markets (Girotra and Netessine, 2011). While these examples did not involve any new technology, there are other business model innovations which are enabled by technological advances, such as Amazon's efficient retailing model that was enabled by advances in information technology.

A key difference between business model innovation and, say, technological or product innovation is that, unlike the latter that usually relies on market or technical knowledge specific to the industry, business model innovation is deeply rooted in the laws of economics and operations management that are universally applicable to a wide variety of industries. This feature allows for the systematization of the process of identifying, selecting and refining such innovations and provides a promising opportunity for operations management scholars to contribute to the study of business model innovation, a topic that is increasingly on the mind of leaders in industry and government.

The need to advance the study of business model innovation is particularly evident when it comes to sustainability. Often the lasting impact of many common human and business activities can be reduced by employing innovative business models that facilitate a more sustainable use of traditional technologies. For instance, IBM Global Financing Division's new business model that combines lease financing and asset recovery programs provides customers with new equipment and

ensures high resale value, creating complementarities that change the usage costs for consumers enabling more sustainable use of existing products. Similarly, Better Place (Girotra et al. 2012) is pioneering a novel business model that can increase adoption of existing electric vehicle technology. Essentially, the Better Place business model separates ownership of the electric battery and the electric vehicle. Better Place owns batteries and maintains a network of switching stations which allows for fast replacement of a discharged battery with a fully charged one, while customers only pay for the miles driven. The business model innovation at ZETA (Plambeck, Forthcoming) is in building an integrated organization that designs and manufactures customized, green, and inexpensive buildings in a factory that employs people with expertise in manufacturing, architecture, green material procurement, and all the functional specialties of the construction industry. This unique organizational structure enables the design and manufacture of entire buildings based on sustainable green technology, to order in a single factory.

These examples represent business model innovation in its purest form: these firms did not invent novel technologies but instead brought new product/service delivery systems that enabled higher adoption and/or better use of existing technologies. Interestingly, ZETA's production to order model is similar to Dell's model, the approach of Better Place of converting sales of products (electrical cars) into sales of services (miles driven) is a potent solution to many other environmental problems (Mont 2002) and, IBM's joint program exploits widely understood economies of scope. These similarities highlight that, in order to create new business models that promote sustainability, we can often repurpose innovations from other industries. What is often missing is a unifying approach that allows one to see this commonality and enable this translation process.

The need for developing new business models extends beyond facilitating more sustainable use and adoption of existing technologies. Organizations that develop innovative new sustainable technologies must often identify new different business models, distinct from those of the incumbents they substitute, to facilitate the commercialization and consumer acceptance of their newly developed technology. For instance, Amyris, FirstSolar and Calera (Plambeck, Forthcoming) all pioneered innovative new technologies, but only when these organizations paired these new technologies with appropriate business models, were they able to achieve commercial viability. Amyris's traditional business model of dealing with suppliers through take-or-pay contracts failed which led to significant write-offs and the organization faces bankruptcy unless it develops a business model that allows it to address these issues and dramatically increases productivity in its Brazilian facility. On the other hand,

FirstSolar, pairs its innovative lower cost photovoltaic panels, with a new business model. Rather than follow the traditional approach of selling these panels, First Solar offers integrated design, construction, operation and maintenance of solar installations. This new business model eliminates key roadblocks to adoption and stimulates demand for the panels. This has helped FirstSolar survive where numerous other competitors failed. Finally, while Calera has the technological solution to produce sustainable cement, it faces many business model issues around sourcing of inputs from suppliers and gaining adoption of its product by the buyers.

2. Searching for New Business Models

How can we, operations management researchers, better understand business model innovations and, more importantly, proactively help design them? Examples of business model innovations are often hiding in plain sight in operations management textbooks and course materials; (cf. Dell, Zara, Timbuk2, Toyota, Barilla and Amazon.com) but they are rarely recognized as disruptive innovations based on operations thinking that transformed industries. In the absence of a unifying framework that identifies and categorizes the common patterns among these innovations and ties them with operations and economics principles, they often appear to be idiosyncratic operational improvements. We next outline a unifying framework for business model innovation, and we use this framework to propose a design-thinking inspired, systematic approach to generating new business model innovation opportunities, selecting among them and refining them through quick prototyping.

Our approach is inspired by the search view of product innovation that conceptualizes innovation as a search amongst different combinations of design attributes (color, size, material, etc.) to find a combination that provides the highest level of performance (ergonomics, reliability, etc.). We identify widely applicable performance metrics and design attributes for business models that facilitate thinking of business model innovation as search amongst different business models to identify models with the highest performance.

3. Performance Metrics for Sustainable Business Models

The sustainability of a system can be measured as its lasting impact on the social, cultural and natural environment. For-profit, sustainable business models allow organization to earn profits in the face of uncertainty and rational utility-maximizing behavior by actors in the model, while having minimal long-lasting impact. In an entrepreneurial context, the odds of business survival and the rate

of growth may be more pertinent rather than profit. Interestingly, in the most desirable of sustainable business models the lasting impact of the business model often contributes to the organization's profits, growth and survival in for-profit organizations, instead of detracting from commercial concerns. In the case of non-profit organizations these may directly be the objectives of the organization.

We argue that, consistent with Teece (2010), "a business model cannot be assessed in the abstract; its suitability can only be determined against a particular business environment and context". Thus, from the point of view of identifying new sustainable business models, we conjecture that it is often most useful to examine business models' performance with respect to two key contributors to the actual performance function (however it is defined- profits, growth or sustainability), rather than the performance directly. The performance of most business models is held back by two types of inefficiencies (which can arise at different stages of the entire value chain):

- *Information Inefficiencies:* decisions in business models are often made without complete or correct information on their consequences, often long before the full information needed to make them becomes available. In the sustainability context, development and adoption of sustainable technology often requires organizations to make risky investments with incomplete information on technology performance, scalability and future technology advances while facing highly uncertain government incentives and regulations. For instance, although energy-efficient light bulbs are more cost-efficient in the long term, customer disbelief in manufacturer claims on energy performance, incomplete information on their lighting performance and on the potential availability of even better technology in the future preclude their wide adoption, holding back both the provider's profits and wider adoption of sustainable lighting solutions.
- *Alignment Inefficiencies:* most decisions are made by individuals or organizations whose objectives are not in line with each other or whose objectives are not in line with objectives of the entire value chain. For instance, a provider selling commercial equipment and after sales repair and maintenance services has limited incentives to design products that limit breakdowns. On the other hand, the user and the system as a whole are better off if incentives of equipment maker were aligned with their incentives and products were designed to be more reliable. In the context of sustainability there are often alignment inefficiencies due to multiple externalities imposed by sustainability-directed actions. Product manufacturers may not want to participate

in collection and recycling networks if their share of the cost of running such network is not aligned with benefits they get from it (Gui et al. 2012). This limits the environmental benefits of the green initiative. These inefficiencies are studied in the field of information economics and, more recently, in operations management.

These two inefficiencies are directly related to the sustainability performance of business models. We have found that rather than focusing on the performance itself, focusing on these two contributory inefficiencies is often more useful to understand failings and sustainability pain points of existing models, to help identify more sustainable business models and, to allow for translating such identified innovations to different contexts.

For example, Dell dramatically reduced information inefficiency by producing computers only after demand information became available and Blockbuster aligned its incentives with incentives of studios through revenue sharing. Likewise, organizations that want to bring a sustainable solution to the market can reduce business model inefficiencies if they follow a simple observation that, like products, business models have certain attributes that can be altered to improve performance. More often than not, in sustainability examples these inefficiencies arise due to interactions of multiple players in the value chain and their failure to recognize externalities that they impose on each other, and due to lack of proper information to make environmentally-friendly decisions.

4. Design Attributes in Business Models

To develop novel business models that have lower inefficiencies than traditional models we must alter associated design attributes and search for new models. We find it convenient to decompose business models into key decisions made by organizations, and to further decompose each decision into four key attributes: WHAT key decisions are made, WHEN they are made, WHO makes them, and WHY they are made. Together, the decisions and their four attributes (or 4Ws for short) are the key design parameters in a business model, akin to the size, material color, etc. in a physical product. Altering these design attributes can help arrive at superior business models as follows:

WHAT: Every key business model decision is predicated on choices the organization has made earlier. In other words, it has chosen to offer a set of products or services, and those choices drive WHAT substantive matters the business model must address. Changing the scope of activities of an organization or changing what decisions must be made, can help arrive at innovative and more

sustainable business models. For instance, an organization that changes its scope of activities or what it does to include managing the secondary market (Oraiopoulos et al. 2012), or to utilize byproducts of the main manufacturing process (see Lee 2011), may derive benefits out of the complementarities and diversification benefits from joint-decision making that reduce risk, inefficiencies and environmental impact, compared to a traditional business model with a more limited scope. In principle, these organizations increased the number of decisions to include diversifying or complementary decisions. Alternately, the organization may just choose to do something different, rather than sell products, the organization may sell the service of the use of the product (Guajardo, et al., 2012).

WHEN: Every decision is made at a point in time relative to the availability of the best information needed to make it. Changing the timing or even sequence of decisions in a business model can often lead to innovative business models. For instance, the use of contests to identify the most promising green technology (rather than investing into one or more technologies right away) can substantially reduce the risk associated with green investments. Notable examples include the Wendy Schmidt Oil Cleanup Challenge[1] and the Progressive Insurance Automotive X-prize.[2] By reversing the sequence in which information is gathered on technology performance and investments are made in a favored technology, contests help reduce the often paralyzing information risks associated with green investments. The changes in sequence allow for delaying investments till the availability of better information. As another example, Patagonia Common Threads Initiative (Reinhardt et al. 2010) changed the time when the company takes responsibility for the product to "from birth to death and then beyond death, back to rebirth" instead of traditional "from production to sales". A full ownership of the product lifecycle reduces the incentive conflicts inherent in a business model where different entities are responsible for the different parts of the lifecycle. With a full horizon view of the product lifecycle, products are designed, manufactured, sold with their rebirth in mind. Re-sequencing, delaying and splitting decisions are typical strategies to achieve such improvements.

WHO: Every decision induced by a business model design is made by a particular person (or persons): an employee, a government regulator, a committee or other organizational structure. Changing the decision maker can often lead to higher efficiencies. For instance, Terrapass (Ulrich,

[1] http://www.iprizecleanoceans.org/competition-guidelines
[2] http://www.progressiveautoxprize.org/prize-details

2008), a carbon offset retailer that was co-founded by one of the authors of this paper, changes the person who decides to reduce carbon emissions. Instead of individuals directly reducing their carbon emissions by investments in new technologies, TerraPass uses its superior information and scale to target their investments to the most efficient of carbon reduction opportunities. Interestingly, this can bring the costs of remediating a typical family's carbon footprint by an order of magnitude or more as compared to uninformed, disaggregated investments made by individuals. Agrawal et al. (2012) show that a business model that empowers a product supplier (e.g., a carpet manufacturer such as Interface Inc., Oliva and Quinn 2003) to retain ownership of the product and make maintenance and disposal decisions in addition to sales and installation, can provide both superior product performance and environmental benefits. Energy efficiency services companies take over installation of energy efficient equipment and share the gains with the focal firm (Aflaki et al. Forthcoming), as does Netafim, a provider of sustainable drip irrigation technology (Lee and Michlin, 2006)

WHY: The design of a business model typically imposes certain goals and incentives on decision makers. Because decision makers are generally rational actors, these factors can powerfully influence the decisions they make. For instance, Recyclebank (https://www.recyclebank.com/) changes the incentives of consumers to recycle by giving them reward points that can be redeemed at participating recyclers while municipalities pay some money for diversion of products from landfills. Aflaki and Netessine (2012) demonstrate that, using long-term contracts fixing electricity prices (so-called feed-in tariffs) governments can increase investment into renewable energy sources. Long-term partnerships with suppliers as pioneered by Toyota and further developed by Li and Fung (Belavina and Girotra, 2012) align the incentive horizon of suppliers and buyers, facilitating risky long-term investments (such as in electric battery production in the late 90s), and ensure better across value chain accountability and compliance with labor standards and environmental norms.

Thinking of business models as a collection of these design attributes structures the landscape of business model innovation opportunities and allows for an organized search of this landscape. It also offers a second advantage; this choice of design attributes frames the business model design as a classic decision making problem to which we can apply insights from operations and economics to advise on the most promising directions for altering design attributes. In short, the 4Ws of a business model should be altered such that *the newly proposed business model empowers the right decision makers with the best available information and value-creating incentives to make the right decisions with measurable consequences.* Using principles of operations and economics, this generic principle can be translated to 12 specific idea

WHAT	WHEN	WHO	WHY
Select focused vs. flexible business model	*Delay decisions as much as possible*	*Transfer decisions to best-informed players*	*Change the profit/revenue streams to align incentives*
Change the scope of decisions	*Change the sequence of decisions*	*Transfer decision rights to the party for which consequences are the least*	*Replace short-term relationships with long-term relationships*
Hedge/complement decisions with each other	*Split decisions to obtain partial information before decision is completed*	*Move the consequences (costs) of the decision to the party that benefits the most*	*Integrate misaligned parts of the value chain*

FIGURE 1 IDEA TRIGGERS FOR BUSINESS MODEL INNOVATION

triggers to alter the four design attributes of every decision (Figure 1). These 12 approaches cover the sustainability examples described above and the vast majority of the hundreds of business model innovations we have documented over the years, spanning examples in supply chain management, service operations, healthcare, manufacturing, non-profits and even government services. Their scope includes innovations within established organizations (such as Netafim and Toyota) to start-up-driven innovations (such as TerraPass and Better Place) (see Girotra and Netessine, forthcoming). Using these triggers, an innovator can start asking questions like "what would my business model look like if I take the current model of the industry/company and apply technique in cell X?"

However, one must remember that idea triggers are not generically applicable rules: a business model arrived at by applying the idea triggers is not guaranteed to be feasible, and commercially or environmentally superior to existing business models. The opportunities generated from applying these triggers should be evaluated on a case by case basis, for reduction in inefficiencies using both analytical and experimental approaches. Further, the goal of these triggers is not to provide an exclusive taxonomy of all innovations— an innovation may be classified in multiple ways, but for the purposes of systematizing idea generation, we have found these triggers to be comprehensive and effective set of brainstorming stimuli.

Taken together, the process of business model innovation can be thought of as an optimization problem, where the reduction of inefficiencies is the objective function, the 4Ws of the decisions implied by the model are the decision variables and the utility maximizing behavior of involved actors contributes to the constraints. While more detailed and precise relationships between the decision variables (4Ws) and the performance (inefficiencies) may be outlined in specific contexts, the

principles outlined in Figure 1 provide generic idea triggers that relate the decision variables to the performance function.

5. A Pedagogical Approach for Business Model Innovation

The design thinking-enabled view of business model innovation can be used to analyze novel business models around sustainability (e.g., see Avci et al. 2012 for rigorous analysis of Better Place Inc.) as well as to catalogue new sustainable business models in case studies. But the most important benefit comes from proactively developing new business models. Teaching innovation is hard and teaching innovation in sustainability is even harder. A vast majority of approaches that we have seen rely on the theoretical analysis of existing business models, e.g., using business model canvas of Osterwalder and Pigneur (2010). We, on the other hand, advocate a more hands-on, experiential learning approach which we have found to work not just in the specific context of sustainability but in generation of new business models for multiple contexts. We have experimented with this approach in numerous executive education programs as well and an MBA/EMBA elective Identifying New Business Opportunities (INBO, for details see www.inboinsead.com). At the heart of these engagements lies the process of generating new business models using the 12 idea triggers from Figure 1, selecting from these potential innovation opportunities and refining them through the use of cheap prototypes. Note that these idea triggers are specific to business model generation rather than product/technology generation techniques that are typically used in entrepreneurship courses. When combined with discussion of recent trends (such as sustainopreneurship), it inevitably leads to numerous sustainability-inspired ideas. Together, we propose a systematic, stage-gate process of generating, selecting and refining potential innovation opportunities (Figure 2). This methodology has three key features.

First, the methodology advocates generation of a large number of potential business model innovation opportunities. Girotra et al. (2010) demonstrate that a key driver of idea quality is the number of opportunities from which the idea is selected. While generating ideas is, by its very nature, a serendipitous task, in our experience, the availability of a systematic idea triggers to generate opportunities, such as in Figure 1, greatly increases the ability of managers and students to generate many innovation opportunities. In effect, this framework transforms a creative task into an analytical task, a task that most practicing managers are far more adept at than open-ended venture idea generation tasks. Idea generation works best when participants work individually to generate ideas

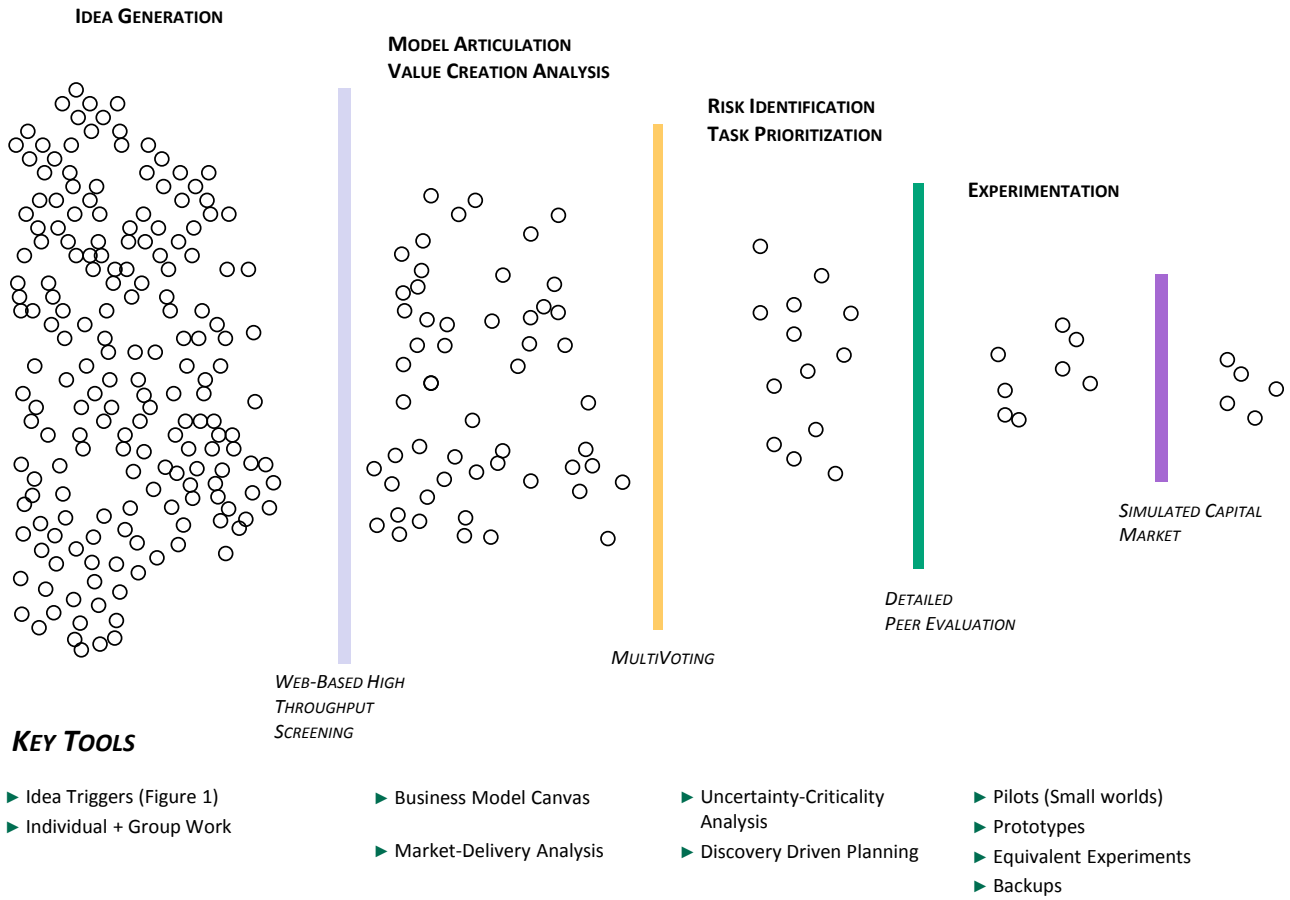

FIGURE 2: A SAMPLE DESIGN FOR A SYSTEMATIC, STAGE-GATE PROCESS OF GENERATING, SELECTING AND REFINING POTENTIAL INNOVATION OPPORTUNITIES

followed by some group discussion of ideas, a hybrid brainstorming process (Girotra et al. 2010). While individual work leverages the parallel search of a large number of opportunities, group work allows individuals to build on ideas developed by others.

Second, the approach prescribes that the generation stage be followed by a series of iterative elimination rounds (an innovation tournament as described in Terwiesch and Ulrich, 2009). Girotra et al. (2010) demonstrates that the use of independent unbiased judgments outperforms the use of experts and group judgments in identifying new business opportunities. Ideas may be evaluated on their potential to decrease the inefficiencies identified in existing business models and by the sustainability of the practices they engender. While early rounds of elimination must favor a fast and efficient mechanism to screen a large number of ideas, later rounds can focus on more precise and careful evaluation of a fewer surviving set of ideas. Moreover, unlike tournaments for new products

that emphasize the need that a new product satisfies, tournaments for new business models should focus on the analysis of inefficiencies that the business model reduces.

Third, while the framework above provides guidelines for generating and selecting between novel business models, like with all innovations, there is substantial venture risk on the extent and viability of the improved business model. Sequencing activities in the development of new ideas so as to reduce risks with minimum resource investment is the key to limiting venture risks. We advocate a two-step approach to this stage: First, the key contributors to risks of new venture success must be identified by using rigorous operations analysis to highlight the key determinants and drivers of the improved business model performance. Second, cheap "business model prototypes" must be designed and used to empirically validate the improvements in performance (see also Chesbrough 2010 for discussion of ex-ante foresight vs. ex-post adaptation in business models). Just as recent product design theory advocates the use of rapid product prototypes that offer only minimal functionality that must be tested; cheap experiments can be used to test only the key determinants of business model success. These experiments can combine primary data collection, small-scale pilots, bare-bones business prototypes and experiments. For instance, before launching full-scale revenue sharing contracts, Blockbuster experimented with them in the Pittsburgh area stores. TerraPass was initially launched and marketed in a very limited fashion to identify the most potent of product concepts. These two approaches require analysis and experimentation skills that are central to the practice and study of operations management. The use of these techniques leads to the refinement of business model opportunities in a fashion such that less attractive innovation opportunities can be eliminated quickly and cheaply, effectively using operations thinking to bring the "fail fast and fail cheap" maxim to business model innovation.

6. Conclusion

Identifying sustainable paths to growth is more central to policy makers and corporate agendas today than at any other time in the past. This focus on sustainability almost always translates into the search for new products and technologies. In the absence of rigorous frameworks and a community of scholars, the search for new business models that complement or substitute these technology advances is often ignored. As a result, in many domains of environmental sustainability, we see that opportunities to make the ownership and use of products sustainable by pairing them with new business models are overlooked. Further, even when new technologies are developed, the lack of

business models that make these technologies acceptable to the customer, viable and scalable restricts their benefits. In this article, we have provided a brief outline of a new conceptual framework that highlights how the operations management community can leverage its deep understanding of risks in business models to facilitate the search for new business models that enable the adoption of sustainable practices. We hope that the proposed framework will be embraced by the operations management community to understand, generate and refine business model innovation opportunities. Our experiences with this approach in a variety of educational programs indicate that it often inspires many fascinating new sustainable business models including such examples as Terrapass (the outcome of the Idea Tournaments class at Wharton), parkBnB (parking spot sharing), Utoypia (the used toy sharing concept), a chain of bio-restaurants in China, a chain of carbon zero hotels and resorts, an integrated service provider for energy efficient electric windows, a gadget sharing web site, fractional ownership of vehicles for use in emerging markets (all examples are from classes at INSEAD) and numerous others.

7. References:

Aflaki, S. and S. Netessine. 2012. Strategic investment in renewable energy sources. INSEAD Working Paper No. 2012/59/TOM.

Agrawal, V.V., M. Ferguson, L.B. Toktay and V.M. Thomas. 2012. Is leasing greener than selling? *Management Science,* Vol. 58, No. 3, 523-533.

Avci B., K. Girotra and S. Netessine. 2012. Electric Vehicles with a Switching Station: Adoption and Environmental Impact, INSEAD working paper.

Amit R. and C. Zott. 2012. Creating Value through Business Model Innovation. *MIT Sloan Management Review*, Spring 2012.

Belavina E. and K. Girotra, "The Relational Advantages of Intermediation," *Management Science*, 58:9, September, 2012, pp1614-1631.

Chesbrough H. 2010. Business model innovation: opportunities and barriers. *Long Range Planning,* Vol. 43, 354-363.

K. Girotra, C. Terwiesch and K. T. Ulrich. 2010. Idea Generation and the Quality of the Best Idea, *Management Science*, 56:4, April.

K. Girotra and S. Netessine. 2011. How to Build Risk into your Business Model. *Harvard Business Review,* May.

K. Girotra, S. Netessine, P. Pokala and D. Gupta. 2011. Better Place: The Electric Vehicle Renaissance. INSEAD case.

K. Girotra and S. Netessine. 2014. The Risk-driven Business Model: Four Questions That Will Define Your Company. Harvard Business Press.

Guajardo, J. A., Cohen, M. A., Kim, S. H., & Netessine, S. (2012). Impact of performance-based contracting on product reliability: An empirical analysis. *Management Science*, *58*(5), 961-979.

Gui, L., A. Atasu, O. Ergun, L. B. Toktay. 2012. Fair and efficient implementation of collective extended producer responsibility legislation. Working Paper, Georgia Institute of Technology.

Hammer, M. 2004. Deep change: how operational innovation can transform your company. *Harvard Business Review,* April.

M.W. Johnson, C.M. Christensen and H. Kagermann. 2008. Reinventing your business model, *Harvard Business Review,* December.

S. Kaplan. 2012. The business model innovation factory, Wiley.

Lee, D. 2011. Turning waste into by-product. Harvard Business School Technology & Operations Mgt. Unit Working Paper No. 07-098

H. Lee and G. Michlin. 2006. Netafim: Migrating from Products to Solutions. Case, *Stanford Business School.*

O.K Mont, 2002. Clarifying the concept of product–service system, *Journal of Cleaner Production*, Volume 10, Issue 3, Pages 237-245.

Oliva, R. and J. Quinn. 2003. Interface's evergreen services agreement. *Harvard Business School case 603112-PDF-ENG.*

Oraiopoulos, N., M.E. Ferguson and L.B. Toktay. 2012. Relicensing as a secondary market strategy. *Management Science,* Vol. 58, No. 5, 1022-1037.

A. Osterwalder and Y. Pigneur. Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers. 2010, *Wiley*.

Plambeck, E. Forthcoming. Operations management challenges for some "Cleantech" firms. *Manufacturing & Service Operations Management.*

Reinhardt, F., R. Casadesus-Masanell and H.J. Kim. 2010. Patagonia. *Harvard Business School case study* 711020-PDF-ENG.

Teece, D.J. 2010. Business models, business strategy and innovation. *Long Range Planning,* Vol. 43, 172-194.

C. Terwiesch and K. Ulrich. 2009. *Innovation Tournaments*. Harvard Business Press.

K. Ulrich. 2008. *TerraPass Inc.,* Wharton Teaching Case.

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