Sustainable Product and Market Development for Subsistence Marketplaces: Creating Educational Initiatives in Radically Different Contexts*

Madhubalan Viswanathan, Ali Yassine, and John Clarke

Developing products and business processes to serve subsistence marketplaces (or the roughly 4 billion poor around the world referred to as the bottom of the pyramid) is a significant challenge for businesses. Despite the importance of subsistence marketplaces, most product development educational curricula have been focused on relatively resource-rich and literate consumers and markets. We teach an innovative year-long product development course which includes an international immersion experience and which covers a broad spectrum of learning from understanding poverty, to consumer behavior, to product development and engineering design specifically for subsistence consumers. This unique course represents a pioneering effort to focus attention and create knowledge about product development, marketing, management, and engineering practices for subsistence marketplaces.

Our two-semester course sequence for graduate-level students in a variety of business and engineering disciplines and industrial design combines in-class pedagogy with experiential learning and results in useful and marketable product concepts and prototypes. Working on projects with multinational companies or startups, students identify an opportunity of general need, conduct field market research to better understand subsistence consumer needs and contexts through an international immersion experience, develop a product concept, convert the concept to a workable prototype, and develop a manufacturing plan, marketing strategy, and overall business plan for the product. Overlaying the content found in a typical new product development lab course we develop a contextual understanding of subsistence marketplaces, setting the stage for new product development. A central aspect of the learning experience is travel to subsistence markets for actual immersion in the context and to conduct market research.

Our course is at the confluence of two of the most important issues facing humanity, subsistence and sustainability. Lessons learned here can also be extended to other radically different contexts, such as future scenarios involving severe energy shortages or climate change consequences. Such educational initiatives provide challenging learning experiences in preparing students for the unique demands of the 21st century.

The challenge of education is to teach students about their future – not our past!

– Unknown

Introduction

In this paper, we describe our experience teaching a unique course on sustainable product and market development for subsistence marketplaces and discuss the implications for product development and management. This course represents a pioneering effort to focus attention and create knowledge about business and engineering practices, and specifically product development, for the roughly 4 billion poor around the world referred to as the bottom of the pyramid (Prahalad, 2005) or as subsistence marketplaces (Viswanathan and Rosa, 2007). Whereas the literature in the fields of business and engineering has resulted from an almost exclusive focus on resource-rich markets, this work extends across literacy and resource barriers to subsistence contexts where a large proportion of humanity resides and survives.
New product development lab courses are not new (e.g., Apple and Vanier, 1988; Cardozo et al., 2002; Eppinger and Kressy, 2002), nor are courses with a multicultural or international perspective. However, what is new here is a focus on developing sustainable goods and services to serve the needs of those living in subsistence marketplaces. Unique here is the juxtaposition of the radically different context of subsistence with the product development process and the resulting potential for insights on new product development to emerge.

Subsistence marketplaces have been described in terms of their size and accessibility, with brand-conscious, connected customers willing to accept new technology (Prahalad, 2005; Viswanathan and Rosa, 2007). The literature has emphasized the market development imperative in terms of the creation of a capacity to consume, the need for new goods and services, dignity and choice for the poor, and the importance of developing trust between buyer and seller. Several principles of innovation have been discussed, including finding sustainable solutions, innovating with process and deskilling work, educating low-literate consumers, designing for hostile infrastructure, and designing innovative distribution chains (Prahalad, 2005). Subsistence marketplaces offer businesses the opportunity to seek out new markets while also contributing to poverty alleviation. Hammond et al. (2007) estimate that 4 billion people around the world are yet to enter the formal economy and constitute a 5 trillion dollar consumer market.

Whereas the literature has generally focused on the potential for new markets, our laboratory course engages students and companies to provide a platform to experiment in greater depth and understand the nature of product and market development in these contexts. This unique learning platform can lead to an in-depth understanding of product development and related marketing and management issues and thereby provide insights for research and practice. The distinct orientation to the role of business in poverty contexts that we take is noteworthy, reflected in our choice of the label, subsistence marketplaces (Viswanathan and Rosa, 2007). Our approach is rooted in understanding buyer, seller, and marketplace behaviors and life circumstances (Viswanathan, Gajendiran, and Venkatesan, 2008; Viswanathan and Sridharan, 2009). This should be contrasted with macro-level economic approaches or mid-level business strategy approaches, such as the base of the pyramid approach. The micro-level perspective complements more macro-level approaches by providing key insights about life circumstances and marketplace interactions of individuals and communities. We take a marketplace rather than a market-based approach where we view these contexts as more than markets to sell to, but as marketplaces to learn from. Thus, we view a business’s role as to view these contexts not as parallel markets to sell to but as preexisting marketplaces that need to be understood. Such understanding then provides the means to find business solutions that can lead subsistence marketplaces to be ecologically, socially, and economically sustain-

BIOGRAFICAL SKETCHES

Madhubalan Viswanathan is Professor of Business Administration at the College of Business, University of Illinois, Urbana-Champaign, and has been on the faculty since 1990. He focuses on two programs of research: measurement and research methodology, and literacy, poverty, and subsistence marketplace behaviors. His work in measurement and research methodology includes a book entitled Measurement Error and Research Design (Sage, 2005). His research on literacy, poverty, and marketplace behaviors includes a book published by Springer in an education series in alliance with UNESCO entitled Enabling Consumer and Entrepreneurial Literacy in Subsistence Marketplaces (2008). He teaches courses on research methods and on sustainable product and market development for subsistence. His research is applied through the Marketplace Literacy Project (www.marketplaceliteracy.org), a non-profit organization that he founded and directs.


John F. Clarke is Clinical Professor in Business Administration and Assistant Dean in the College of Business at the University of Illinois at Urbana-Champaign. John joined Illinois in 2004; he has a diverse professional background in both industry and academia. At Illinois, his teaching focuses on leadership, entrepreneurship, and international business. He has developed international immersion programs for undergraduates, graduates, and executives and he has led over twenty international immersion trips with a focus on locations in India and China. Dr. Clarke has a degree in engineering and a Ph.D. in Physics from the University of Leeds, U.K., and an MBA from Illinois. He spent over ten years as a management consultant working in North America, Europe, and Asia with large multinational companies. As a consultant, he assisted clients in a variety of areas including new product development, supply chain management, finance, and operations.

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WHEREAS THE LITERATURE HAS GENERALLY FOCUSED ON THE POTENTIAL FOR NEW MARKETS, OUR LABORATORY COURSE ENGAGES STUDENTS AND COMPANIES TO PROVIDE A PLATFORM TO EXPERIMENT IN GREATER DEPTH AND UNDERSTAND THE NATURE OF PRODUCT AND MARKET DEVELOPMENT IN THESE CONTEXTS. THIS UNIQUE LEARNING PLATFORM CAN LEAD TO AN IN-DEPTH UNDERSTANDING OF PRODUCT DEVELOPMENT AND RELATED MARKETING AND MANAGEMENT ISSUES AND THEREBY PROVIDE INSIGHTS FOR RESEARCH AND PRACTICE. THE DISTINCT ORIENTATION TO THE ROLE OF BUSINESS IN POVERTY CONTEXTS THAT WE TAKE IS NOTEWORTHY, REFLECTED IN OUR CHOICE OF THE LABEL, SUBSISTENCE MARKETPLACES (VISWANATHAN AND ROSA, 2007). OUR APPROACH IS ROOTED IN UNDERSTANDING BUYER, SELLER, AND MARKETPLACE BEHAVIORS AND LIFE CIRCUMSTANCES (VISWANATHAN, GAJENDIRAN, AND VENKATESAN, 2008; VISWANATHAN AND SRIDHARAN, 2009). THIS SHOULD BE CONTRASTED WITH MACRO-LEVEL ECONOMIC APPROACHES OR MID-LEVEL BUSINESS STRATEGY APPROACHES, SUCH AS THE BASE OF THE PYRAMID APPROACH. THE MICRO-LEVEL PERSPECTIVE COMPLEMENTS MORE MACRO-LEVEL APPROACHES BY PROVIDING KEY INSIGHTS ABOUT LIFE CIRCUMSTANCES AND MARKETPLACE INTERACTIONS OF INDIVIDUALS AND COMMUNITIES. WE TAKE A MARKETPLACE RATHER THAN A MARKET-BASED APPROACH WHERE WE VIEW THESE CONTEXTS AS MORE THAN MARKETS TO SELL TO, BUT AS MARKETPLACES TO LEARN FROM. THUS, WE VIEW A BUSINESS’S ROLE AS TO VIEW THESE CONTEXTS NOT AS PARALLEL MARKETS TO SELL TO BUT AS PREEXISTING MARKETPLACES THAT NEED TO BE UNDERSTOOD. SUCH UNDERSTANDING THEN PROVIDES THE MEANS TO FIND BUSINESS SOLUTIONS THAT CAN LEAD SUBSISTENCE MARKETPLACES TO BE ECologically, SOcIALLY, AND ECONOMICALLY Sustain-

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able marketplaces. Businesses should find profitable niches that are harmonious with these goals and with the efforts of other entities in this arena, such as governments and non-governmental organizations. Our marketplace orientation, thus, leads to a number of central elements in the learning experience we describe below (e.g., understanding life circumstances and existing marketplace dynamics as a starting point, creating solutions that are locally sustainable in terms of economy, culture, and environment). Efforts to enable the large proportion of individuals living in subsistence to participate in the marketplace have to also be guided by the need to find sustainable solutions that preserve natural resources for future generations.

The search for growing markets is but one line of reasoning for engaging in subsistence marketplaces. Less intuitive is the possibility that such insights based on quality products designed at affordable costs for the harshest of conditions with minimal resources can, in turn, benefit all markets. Subsistence conditions emphasize the need to conserve extremely scarce resources and experience and expertise in such demanding contexts can in turn benefit all contexts in an era of increasingly scarce resources and looming environmental problems.

At the outset we should note that this learning experience is part of a larger program of work over many years characterized by rich synergies between research, teaching, and social initiatives (Viswanathan et al., 2008). The composition of our team is also noteworthy; core members of our research team are individuals from the subsistence contexts we studied with decades of experience in community development. Our course has a number of learning objectives: (a) to understand the radically different context of subsistence, (b) to generate new insights about business and engineering, (c) to understand product and market development for this context, and (d) to derive lessons for non-subsistence contexts. We provide a description of the course and our experience in teaching it and discuss implications for product development, marketing, management, and engineering education, research and practice.

Course Description

Our two-semester course sequence on sustainable product and market development for subsistence marketplaces combines in-class pedagogy with experiential learning and results in useful and marketable product concepts and prototypes. Graduate-level students and outstanding senior undergraduate students in a variety of disciplines including business, engineering, and industrial design learn and use principles of business planning, marketing, cost accounting, project finance, engineering design, and manufacturing to develop successful and profitable new products for subsistence marketplaces.

Students work over two semesters to identify an opportunity of general need, conduct field market research to better understand subsistence consumer needs and contexts through an international immersion experience, develop a product concept, convert the concept to a workable prototype, and develop a manufacturing plan, marketing strategy, and overall business plan for the product. In the first four years of executing this class we have partnered with a variety of multinational companies, startups, and social enterprises. Projects have focused on a variety of product categories ranging from information technology to food and beverages.

Overlaying the content found in a typical new product development lab course we develop a contextual understanding of subsistence marketplaces. This type of immersion in the consumer context sets the stage for new product development. Travel to subsistence markets (our initial focus has been on India, the location of our research) for actual immersion in the context and to gather specific market information is a central aspect of the learning experience.

The course addresses a number of issues, a few of which are listed as exemplars: What are the characteristics of successful and unsuccessful products for subsistence marketplaces? How should products be designed for such marketplaces? How should market research be conducted throughout the new product development process? Detailed description of course elements is provided below and the full course schedule can be found on the course website (http://www.business.uiuc.edu/subsistence).

Course Design and Class Enrollment

In our pilot effort in 2006, we used an application process to build a class of diverse students, with a broad range of technical and business knowledge, skills, and backgrounds. Several information sessions were held on campus and faculty assistance was sought to build a class consisting of business, engineering, and
Virtual Immersion in Subsistence

Five weeks of virtual immersion in subsistence contexts in the Fall semester includes a poverty simulation, analysis of interviews of subsistence individuals and videos, development of conceptual models of poverty, low literacy, and consequences, and of needs, products, and market interactions. A number of individual assignments are used to learn about poverty in a variety of different cultures and contexts, such as the United States and India, and understand the commonalities and differences through comparison and contrast. Students begin to learn about poverty in a context they are familiar with, i.e., the United States, before moving to unfamiliar contexts of subsistence, such as developing economies with widespread and extreme poverty.

Before the first meeting, students are asked to read a book providing rich biographical accounts of living in poverty in the United States (e.g., *Nickel and Dimed* by Barbara Ehrenreich). The first meeting includes a poverty simulation conducted by the Cooperative Extension program at the university, which serves a large population in the state living in poverty through nutrition education and other programs. In this simulation in a face-to-face setting, students are assigned to specific roles in families and asked to make financial decisions with limited amounts of money over a four-week period. Each week is simulated in the course of about 15 minutes where students play their characters and interact with shops and government offices staffed by the organizers of the simulation. A number of needs, such as food, medicine, rent, and so on, have to be met while paying for transportation and other services. Often, basic necessities have to be foregone in order to make ends meet. The simulation concludes with the organizers asking students assigned to each family to relate their experiences and then providing a summary of poverty in the state. Students are asked to complete an assignment where they describe the details of their experience in the poverty simulation, their own emotions and behaviors when participating in it, and broader lessons learned about living in poverty. This simulation enables students to think about poverty as well as the constraints that arise as a result. Often, students relate how they assumed that people chose in some way to live in poverty but in fact learn that it is very difficult to get out of the vicious cycle of poverty. They develop an appreciation for the economic, psychological, and other factors that need to be overcome by those living in poverty.

For the second week, students are asked to read two rich, in-depth interviews of buyers and sellers living in subsistence in India, selected from a larger set of interviews. These interviews were conducted as part of a research program on this topic (Viswanathan, 2007). Students are asked to write first-person narratives of the lives of individuals interviewed. The class discussion in the second week, partially organized around specific interviewees, is wide-ranging and touches on various aspects of poverty as well as issues of literacy and culture. The discussion is not restricted to poverty in one country, but rather, students from different cultures and backgrounds are asked to make observations about poverty in their respective cultures. Such an approach enables a bottom-up, data-driven discussion of insights based on students’ analysis of interviews as well as broad-based coverage of poverty in different contexts.

In preparation for the third week, students are asked to read two more interviews, covering both
buyers and sellers across the total number of interviews they read. They are asked to develop a model of poverty covering antecedents and outcomes. The model can take a number of forms, such as a conventional causal diagram, or a collage that illustrates antecedents and outcomes. Students from engineering, industrial design, and business are very creative in this open-ended approach to understanding poverty. Class discussion in Week 3 is organized around presentations of poverty models by students. Videos of life circumstances in subsistence are also introduced to generate class discussion. Noteworthy in the first three weeks is the focus on a deep understanding of subsistence contexts, which provides a basis to understand the marketplace realm in the next weeks and is central to our marketplace orientation. In the last two iterations of this offering, we have introduced an assignment where students develop models that capture local environmental issues.

In Week 4, students analyze additional interviews from the original pool, as well as videos to derive models of the set of needs, products, and markets for individuals living in subsistence, thus moving the focus to the marketplace realm. The class is organized around presentations by students about needs, products, and markets. In recent iterations of this offering, we have introduced an assignment where students develop models that capture local environmental issues.

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Emersion of Business, Design, and Engineering Principles for Subsistence Marketplaces

In this part of the course, the aim is one of emersion of principles for product development, marketing, management, and engineering, through comparison and contrast with principles for non-subsistence contexts. Essentially, in light of immersion in an unfamiliar context, emersion refers to resurfacing to evaluate familiar engineering business and design concepts that have largely developed in relatively resource-rich settings. This is partly accomplished through cases that are selected to cover a range of issues including product development, technology, engineering, distribution, promotion, and pricing. Groups of students are formed for case analyses, with responsibilities divided among them to distribute broad discussion questions and lead the discussion, or submit write-ups. We have used three to five cases in our previous experiences including ITC-Echoupal, Annapurna Salt, and Jaipur Foot Company (Prahalad, 2005), the aim being to cover different topics and subsistence contexts, although there is an overrepresentation of cases about India in the literature. The analysis of each case focuses on the following issues: needs and consumer behavior (specific need being served, relevant consumer behaviors, product and market context, larger context of life circumstances), market research (examples of methods used, suggestions for methodological improvements), management and engineering issues, technology, products, distribution, promotion, pricing, recommendations for product and market development for subsistence marketplaces, and specific lessons learned for group projects.

Given the diverse backgrounds of students, a wide-ranging set of readings in business is used, with specific topics being covered in depth in class discussion. The approach to date emphasizes marketing management, which covers topics such as marketing philosophy, consumer behavior, marketing research, new product development, pricing, promotion, and distribution. Product design is covered in a separate session providing students with an introduction to the topic to enable idea generation and screening and to anticipate the direction of the project in the Spring semester. The topic of marketing research is covered in some depth in preparation for designing research methods for group projects to be executed during the field trip. We also invite guest speakers during this part of the course, ranging from technologists to commercial and social entrepreneurs, to discuss their experiences in subsistence marketplaces.

Group Project

Student groups are formed in the middle of the semester based on background, skills, and interest in potential project topics, to work with partnering
organizations on potential projects. Our partners have ranged from a small startup to several large multinationals and social enterprises, in the arenas of information, communication and computer technology, food and beverage, and health and hygiene. Students interact directly with managers to better understand existing marketplace challenges, issues, and experiences and to determine the focus for the project. For example, some companies may request a focus on a narrow product category, such as a beverage market, whereas others may encourage consideration of a wide range of product categories.

Groups then work to generate a wide range of ideas and approaches erring on the side of inclusion. This ideation stage can be facilitated by reviewing video and interview-based material and completing image-based immersion exercises to consider needs and ways to address them, a market-based approach. Alternatively, technologies can be considered that could lead to innovative product ideas. In the next stage, the list of ideas is narrowed carefully; the aim is not to reduce to a single idea but rather to have a manageable set of ideas as a basis for designing qualitative research. Qualitative market research instruments are readied for use during the immersion experience. Students are encouraged to develop visual material representing product ideas that will facilitate the data-collection process. Throughout this process, groups summarize their progress to the rest of the class, thus sharing and learning from the set of projects addressed in the class.

International Immersion Experience

The class travels for immersion in the context and to conduct market research during part of the winter break. Over the years, trips have included Chennai, Bangalore, Hyderabad, Jabalpur, Agra, and Delhi, as well as rural parts of India, in December-January. Students observe households in urban and rural subsistence contexts, as well as retail and wholesale outlets. Students interview low-literate, low-income individuals in urban and rural settings to conduct market research for their group projects. Students also visit educational institutions and corporations engaged in the development of innovative technologies for subsistence contexts, and social enterprises providing services. The immersion experience has been a central and transformative experience in the larger context of the course. A number of immersion aspects of the trip are central to the learning experience. Students spend long days with many interactions with subsistence individuals and contexts. These interactions are not scripted and allow students to engage in a discovery process in a radically different context. They are encouraged to reflect on what they are observing by maintaining diaries and through debriefing and facilitated discussion sessions.

The trip takes many months of careful planning and preparation and is preceded by detailed orientation sessions for students. The nature of the experience, interacting with individuals and communities in urban and rural areas, requires careful planning and rehearsal and the cooperation of a number of organizations and individuals. Many of the amenities and facilities that are taken for granted in field visits to corporations or in other field trips in middle-class settings cannot be assumed here. For instance, careful planning is required to select villages to visit, to ensure that individuals are willing to be interviewed, to ensure that facilities are available to conduct interviews, and so on. Our ability to organize the field trip is greatly facilitated by a core team of individuals from the very contexts we studied who have been central to our research, teaching, and social initiatives. We draw on the cooperation of a number of community-based organizations and self-help groups as well as educational institutions and companies. The relationships we have developed over many years through research and social initiatives (Viswanathan et al., 2008) are central to implementing the immersion experience.

Product Design and Development

Spring semester builds on the learning and data gathered in the field to convert concepts to workable prototypes, and to develop manufacturing, marketing, and business plans. Product design and development is a well-researched and documented subject within the context of resource-rich and formal economies (Pugh, 1991; Ulrich and Eppinger, 2007). However, in subsistence contexts, it remains a highly unexplored and unstructured area of research and practice (Donaldson, 2006). Accordingly, the Spring semester focuses on teaching a systematic and structured approach for developing products and services for subsistence marketplaces. This includes conceptual design, system (architectural) design, detailed design, financial modeling, and prototyping methods. In addition, it includes writing project mission state-
ments, business plans, and other related topics at the intersection of business and engineering. The main objective is to educate students on product development topics while focusing on relevant issues for subsistence marketplaces such as: (a) design functionality and its fit to social and cultural needs or norms, (b) design affordability and cost-effectiveness, (c) design robustness and its ability to withstand harsh operating conditions, and (d) design manufacturability and local sourcing of materials, parts, and expertise.

This part of the course commences with debriefing sessions which usually take a “show-and-tell” format. Each team prepares a set of slides that often include photographs and videos taken during the immersion experience and present their observations and experiences. Students describe qualitative interviews and observations and broader impressions based on the overall trip experience. The team concludes the brief by presenting one or a few perceived market opportunities. Next, we discuss the characteristics of an effective business plan using several documented cases (Horan, 2004; Sahlman, 1997). Project and team management issues are also discussed in class, focusing on project scheduling techniques, and a detailed list of “Do’s & Don’ts” for effective team communication and workload sharing and distribution.

In the second week, we cover three topics: state of design practices in developing countries, importance of proper needs assessment in subsistence contexts, and appropriate technologies. We discuss the various design strategies and processes observed in developing countries to identify design opportunities and constraints (Donaldson, 2006; Tybout, 2000). We aim to highlight the notion that design practices and processes must be consistent with local conditions in order to support sustainable economic development, emphasizing our marketplace orientation and the need to enable sustainable marketplaces. Next, we discuss the importance of deep contextual understanding as a necessary precursor to any engineering design endeavor; particularly in a subsistence context. A contextual needs assessment method based on recent research is described in detail and discussed in class to discover and document the “how,” “where,” and “who” factors of the design context (Green et al., 2006; Rodriguez, Diehl, and Chistiaans, 2006). We finally cover intermediate or appropriate technology (Schumacher, 1973), providing an effective yardstick for the student groups to evaluate whether technologies are suitable for subsistence marketplaces (Prahalad and Hammond, 2002). We emphasize that appropriate technology does not necessarily mean primitive or less advanced. On the contrary, a quantum leap in technology may be required in subsistence contexts when compared to advanced economies (e.g., use of cell phones and wireless technology due to lack of infrastructure for landlines).

In preparation for the third and fourth weeks, the students are asked to read articles concerning quality function deployment (QFD) method, innovation processes, and design decomposition approaches (Hargadon and Sutton, 2000; Hauser and Clausing, 1988; Stone, Wood, and Crawford, 2000). Our objective in these weeks is to teach students a way of mapping customer requirements that were developed during the Fall semester and the immersion experience into meaningful and measurable engineering criteria or specifications. Once these quantifiable and measurable attributes are defined, students have a documented list of measurable attributes that their designs should adhere to in preparation for the next stage of development, which concerns concept generation and selection. During concept generation, brainstorming techniques, design decomposition (function diagrams), morphological analysis, and voting techniques are covered. Students are then asked to go through several (typically two or three) rounds of exercises focused on finding design solutions for subsistence marketplaces (usually, we choose arenas where a product that the students are not likely to be aware of already exists). Sources of design examples for subsistence marketplaces are available on the Internet (e.g., designthatmatters.com).

Modular concept generation can be enabled by decomposing a black-box model of the overall desired product functionality into sub-problems and sub-functions that collectively deliver the intended or desired overall product functionality. This is accomplished by identifying subsistence functions that can be grouped together and implemented through a single subsystem or module (Stone et al., 2000). A key advantage of identifying the modules that cater most effectively to critical subsistence needs is the ability to generate solution concepts for modules that simultaneously encapsulate subsistence-specific requirements and allow for product adjustability (and upgradeability) by consumers. This approach allows the development team to address important sub-functions that require special attention in subsistence marketplaces.

An aspect of concept generation for subsistence marketplaces which we found very helpful was to ask...
student teams to search the Internet for products designed for unfamiliar contexts. These types of products are helpful in at least two respects: to study how customer needs were elicited in such contexts (Hannukainen and Holtta-Otto, 2006), and as a source of innovation to use in subsistence marketplaces (Geschka, 1986; Herstatt and von Hippel, 1992). Such design contexts include products for extreme situations, such as assistive products for elderly and disabled customers, or for emergencies or disasters. For example, the freplay radio, originally designed and marketed for emergency applications, offers a solution to educate and broadcast information to entire villages that lack electrical power and cannot afford to buy batteries (Chick, 1997). Children’s toys are another useful source of innovation, with their ruggedness, simple and intuitive user interfaces (relevant for low-literate consumers), simplistic designs, and inexpensive materials (e.g., Kinkajou projectors; http://designthatmatters.org).

During concept screening and selection, we propose a rating matrix to choose a single concept for further development from the various solution concepts brainstormed based on a Pugh rating chart (Pugh, 1991). A subsistence Pugh chart is similar to a traditional Pugh chart, where the alternative solution concepts are listed in the columns of the selection matrix and selection criteria are listed in the rows of the matrix. However, special attention is devoted to the selection criteria used in the chart. In this task, we develop a set of subsistence-specific selection criteria based on the type of product developed and the subsistence context addressed. Students also learn about the various prototyping techniques, including a thorough discussion of strengths and weaknesses of each technique for subsistence contexts (Ulrich and Eppinger, 2007).

In the fifth week, students are introduced to the world of materials and their general properties (Ashby and Johnson, 2003) and learn various traditional material removal and forming processes, and particularly plastics injection molding, using short instructional videos (SME, 2003, 2004). Our main focus here is on manufacturing strategies and material sourcing decisions as they relate to a particular subsistence context. Local manufacturing is beneficial to both the enterprise and local community as it is cost-effective and imparts new skills to local people. Local parts and materials can be sourced and local manufacturing provides new employment opportunities to the community. In addition to product design, it is also essential to consider servicing and maintenance issues that could potentially arise from new products. Issues in providing reliable maintenance for the products that become an integral part of subsistence individuals’ lives include localized provision of service and supply of specific parts.

The sixth week focuses on the financial side of product development and production economics. We use a hands-on example of an Excel-based model for performing financial analysis and determining the financial and social return on investment for the project. Students learn about the notion of robustness using Taguchi’s robust design methodology (Taguchi and Clausing, 1990). At the concept development stage, students evaluate the robustness of their concept; whether it will work in a variety of environments, for a variety of customers, and under conditions with variation anticipated in a particular subsistence context.

Throughout the first six weeks of this semester, we aim to equip students with various required competencies and tools that can be applied to their projects. The rest of the semester focuses on analyzing case studies on design for subsistence marketplaces in more detail. Through the use of case studies, each student group addresses the following: needs assessment (specific need being served, and relevant consumer behavior), technology appropriateness (including functionality and improvements), engineering issues, product design, industrial design, manufacturing technology, recommendations for design and development for subsistence marketplaces, and specific lessons learned for group projects. Guest speakers, consultation sessions, project deliverables, and design briefs are scheduled throughout the Spring semester.

**Product Development Deliverables and Evaluation**

Though most teams begin the immersion experience with a small set of ideas, they usually return with a single product opportunity to pursue further during the Spring term. The final deliverables of the group projects include a detailed written report documenting the various development steps and design decisions, a detailed business plan, and an oral presentation. Intermediate deliverables are: (1) Preliminary Mission Statements and project schedules (includes identifying major stakeholders, target markets, and major project milestones) – Week 3; (2) Conceptual Design (developing sketches of the one or two most promising alternative solution concepts) – Week 5; (3) Detailed
Design (detailed drawings, engineering specifications, material selection, and preliminary cost analysis; written report and a midterm oral presentation) – Week 8; (4) Financial Modeling and Manufacturing Plan (breakeven analysis and project financial feasibility analysis; make/buy recommendations and local content decisions) – Week 11; and (5) Development of Prototype and Final Business Plan – Week 14. Intermediate deliverables are about 2–3 weeks apart and are intended to allow students to apply the concepts discussed in class, obtain feedback, and make revisions. Members of the research team in India are also able to conduct additional market research at the detailed design stage to support the projects.

Depending on the complexity of the product, and time and cost constraints, prototypes vary in comprehensiveness from a computer-aided design or a simulation model to a physical prototype. Physical prototypes range from a look-like or work-like prototype to a beta prototype. Final presentations are made in front of a diverse audience including organizational partners, other faculty and staff, and students. The final presentation and written report is evaluated based on multiple criteria: fulfillment of subsistence marketplace need(s), innovativeness and sustainability of the solution, attention to details and execution of the design, thoroughness of the manufacturing plan, comprehensiveness of the prototype, and coherence of the business plan.

Outcomes

In terms of the impact of the learning experience, in addition to prototypes and business plans that have met the criteria described above, student feedback has been extremely positive, with descriptions of the experience as being transformative or life-changing. Student recruitment has become easier as past students promote the course and speak to the value of the experience.

Corporate partners have also provided very positive feedback on the quality of the prototypes and business plans and our sponsors have been very engaged. One sponsor, a senior vice president at a large global food company, in the course of a trip to India, travelled to meet with the students at the end of their immersion experience in order to better understand the learning outcomes and to participate in the reflection process. Another sponsor, from a large global software company, was very appreciative of the interactions with students and the quality of the output and keen to learn about the insights gained from the course.

The time frame of four complete year-long cycles is perhaps too short to judge whether actual products will be developed from one or more of the prototypes. However, we are beginning to see organizational sponsors considering working models or using aspects of the business plan. In fact, we are increasingly seeking organization sponsors who are likely to take the outcomes to the field. We are developing prospective case studies based on a number of the project reports for use in future classroom instruction. These cases are unique in taking the marketplace orientation we described earlier and, rather than being retrospective, reflect business solutions that could be carried out in the future.

Discussion

The pioneering nature of this course lends itself to some unique learning opportunities for students. Students have a full and first-hand experience of applying principles of new product development in a radically different context. They learn innovative ways of conducting market research to learn the needs of a unique customer segment and then apply this knowledge and information to develop new products which then can function in a radically different context. The course provides an opportunity to compare, contrast, and therefore sharpen product development, marketing, management, and engineering skill sets for traditional marketplaces. Therefore this course is of great benefit for students who intend to work in any context, as lessons learned for subsistence marketplaces can in turn be applied in other marketplaces. The course provides an opportunity to broaden one’s perspective across cultural as well as literacy and resource barriers. Our ability to provide such a course is based on extensive experience in research, teaching, and social initiatives and a team composed of individuals from the subsistence contexts we study.

Our experience also speaks to the nature of product development in subsistence marketplaces. Our course is organized around understanding life circumstances of individuals living in poverty. In fact, we do not bring focus to the marketplace realm until about four weeks into the course. This is deliberate, emphasizing the need for students (and managers and researchers) to immerse themselves in a context that they usually
cannot personally relate to and are not familiar with, that of subsistence. Most students (managers and researchers) have not experienced the kind of poverty we focus on and are also very literate. Thus, virtual immersion in subsistence contexts is the foundation of the course with actual immersion occurring during the international immersion experience. Most important perhaps, when compared to product development in relatively resource-rich contexts that managers can relate to, is the need for deep listening and understanding of customer needs. In resource-rich contexts, product designers are themselves customers in similar contexts. Issues, such as latent needs and cultural sensitivities, that managers are not familiar with, take on importance in subsistence marketplaces.

Additionally, several unique aspects must be carefully considered when developing products for subsistence marketplaces, many of which are related to the adage of doing more with less. Less expensive and more robust products that can withstand harsh operating conditions and misuse, with user-friendly interfaces for low levels of literacy are key elements. Innovative solutions extend beyond the engineering design phase, to include many aspects of manufacturing and marketing as well in light of the lack of basic infrastructure assumed in developed contexts. Anticipating unconventional usage situations born out of necessity is another important aspect of product design. In traditional marketplaces in developed economies, products have an established (and streamlined) approach to marketing, using established infrastructure for functions such as distribution and promotion. In contrast, marketing activities in subsistence marketplaces from promotion to distribution represent significant challenges and must be considered during product development and not as an afterthought or sequentially after product design and development. Rather, these issues must be considered simultaneously with product design and development and be an integral part of a coherent, holistic development plan. Issues in various marketing functions include market research (e.g., contextual product testing), promotion (social network mediated communications, visualization of customer benefits), distribution (developing partnerships and reaching fragmented rural locations), pricing (explicating the value proposition), and relationships with diverse organizations (Sridharan and Viswanathan, 2008; Viswanathan et al., 2008).

Another important aspect of product development in subsistence marketplaces is in engaging subsistence communities at every stage in the design and development process, and not treating them solely as end consumers (Murcott, 2007). Such an approach builds on immersion to understand life circumstances described above in maintaining continuous learning from individuals living in subsistence. It is essential to treat customers and communities as partners, enabling local entrepreneurship, improving education and health, and conserving resources.

Finally, we emphasize sustainable solutions that place individual and community welfare as well as the local environment front and center. Our nuanced approach emphasizes designing solutions that fit within the preexisting marketplaces while carefully envisioning the role of business, in concert with governmental and non-profit organizations, in enabling such marketplaces to move toward being economically, socially, and ecologically sustainable marketplaces. In this regard, we have argued that a focus on social good in a product-relevant sense should be a central aspect of business processes including product development (Viswanathan, Seth, Gau, and Chaturvedi, 2009).

Our learning experience provides a platform that engages students and companies to create detailed insights about product development in subsistence marketplaces. We list a number of insights from juxtaposing the product development process in the subsistence context in the form of questions as our learning is ongoing. These questions are tied to the projects and have emerged as we developed and executed this course. How should managers and researchers unfamiliar with subsistence educate themselves through immersion? How should market research be conducted as a basis for product development, promotion, distribution, and pricing? What should the product development process for subsistence marketplaces look like? How should interfaces be designed for low-literate subsistence consumers? How should the design process anticipate local manufacturing opportunities of the opportunity to incorporate small entrepreneurs into the value chain? How should existing infrastructure or lack of infrastructure be incorporated into the product development process? How should usage situations be envisioned in the product development process? How should products be designed at low cost while being of good quality and high reliability in hostile working conditions? How can conventional products be used as vehicles to improve welfare (e.g., nutritional additives in food)? How should packaging be ecologically friendly and sustain the local environment? How should product benefits be visualized and communicated to low-literate consumers?
Our educational initiative has provided a basis for a number of educational modules. We piloted a five-week module on sustainable businesses for subsistence marketplaces for first-semester undergraduate students as part of a course on professional responsibility. This module consists of understanding subsistence marketplaces, generating and choosing sustainable product ideas, developing and presenting a brief business plan, and presenting the project in a poster session. This course has been scaled to all (approximately 600) incoming business students. We have also introduced a seven-week course for MBA students on sustainable marketing enterprises. Our approach here was to use insights from subsistence marketplaces as a starting point to consider sustainable consumer behavior, product design, promotion, distribution, and pricing in all contexts. At a curriculum level, we introduce this topic broadly through an early module or course and then provide a capstone integrative experience for interested students. Immediate plans also include modularizing the key elements of the course into day-long or two-day-long learning experiences for students, managers, and social entrepreneurs. Such learning modules can be customized to emphasize a number of themes, such as professional responsibility.

At the broadest level, our focus is on presenting radically challenging contexts in which transformative education experiences can take place. Our course is at the confluence of subsistence and sustainability, representing two of the most important issues facing humanity. Such a radically different context where there is much potential for social good strikes a chord with students. Lessons learned here can also be extended to other radically different contexts, such as reflected in products for disaster areas, for individuals with disabilities, or for future scenarios involving severe energy shortages or climate change consequences. Intertwined with our course is the need for interdisciplinary solutions and a global perspective. In summary, such educational initiatives provide a challenging learning ground in preparing students for the unique demands of the 21st century that have to be collectively confronted by humanity.

References


