DREAMDEV

A PARTICIPATORY FRAMEWORK TO CATALYZE DEVELOPMENT IN EMERGING ECONOMIES

Tim Tocci
Savannah College of Art and Design
tim@poweredbysilas.com

PROLOGUE

My eyes followed our payload of rocks from the Haitian orphanage addition as they tumbled down into the ravine over fetid mountains of refuse, and then I noticed other movements among the heaps: children crawling and scavenging for valuable bits of rubbish. The size of the ravine, the depth of the trash, and the despondency of the children all confirmed my sense that our work was a small drop in the large bucket of poverty. This lesson—combined with similar insights from building projects in Nicaragua, teaching English in Jordan, and touring the post-soviet nations of Georgia and Armenia—revealed the need to partner with local communities to develop sustainable solutions. My goal with this thesis is to inspire more designers to address these difficult problems of great significance, and to work in such a way that respects and values local contributions to the end solutions.

1. INTRODUCTION

As global connectivity improves and enables remote collaboration in the twenty-first century, new tools will emerge to address the world's "wicked problems." While Thomas Friedman asserts that the world is flat but unequal (Friedman 2007, x), C. K. Prahalad illustrates this inequality with the economic pyramid of the world. Despite greater access to collaborative technologies coined "Flatteners" by Friedman (51), many idealistic developers and designers in Tier 1 of Prahalad's pyramid have failed to develop sustainable solutions for people at the bottom of the pyramid (BOP). While Friedman argues that the world continues to grow "flatter" with freely accessible communication channels (196), massive needs as articulated and measured by the UN's Millennium Development Goals remain to be met.

Paul Polak, founder of International Development Enterprises, writes "The current 'answer to poverty' is the UN-sponsored Millennium Development Goals initiative, led by Jeffrey Sachs and backed by 189 governments... In 2004, about the midpoint in the 1990-2015 time period for accomplishing all this, the World Economic Forum in Davos concluded that efforts toward achieving the UN's Millennium Development Goals were faltering badly" (Polak 2008, 30-31). These goals represent Horst Rittel's "wicked problems" as they exemplify the eighth property—symptoms of the larger problem of poverty.

1.1. DESIGN PROBLEM

While many projects and methodologies exist for product design in the developing world, methods that account for users' values and environment are necessary. Liz Sanders, Eva Brandt, and Thomas Binder (2010) define a method as "a combination of tools and techniques that have been strategically put together to serve a specific purpose" (4). Examining available tools from IDEO's Human Centered Design Toolkit, frog's Collective Action Toolkit, Lextant's design research practices, and Sander's MakeTools papers, I propose a participatory design method to address wicked problems in emerging markets.

To test the validity of this method, I have chosen to perform a case study in Ometepe, Nicaragua—a volcanic island in the middle of Lake Nicaragua. Ometepe is the world's largest island in a freshwater lake with a landmass of 276 km^2 and more than 37,000 inhabitants. As the second poorest nation in the Western Hemisphere, Nicaragua exemplifies other least developed countries (Figure 1).

GLOBAL HUMAN DEVELOPMENT INDEX COMPARISONS

$y = 0.0049x - 9.3042 \quad R^2 = 0.9675$

$y = 0.0069x - 13.346 \quad R^2 = 0.9982$

$y = 0.005x - 9.254 \quad R^2 = 0.9981$

$y = 0.0042x - 7.6973 \quad R^2 = 0.9966$

Legend:
- Nicaragua
- Medium human development
- Latin America and the Caribbean
- World
- Linear (Nicaragua)
- Linear (Medium human development)
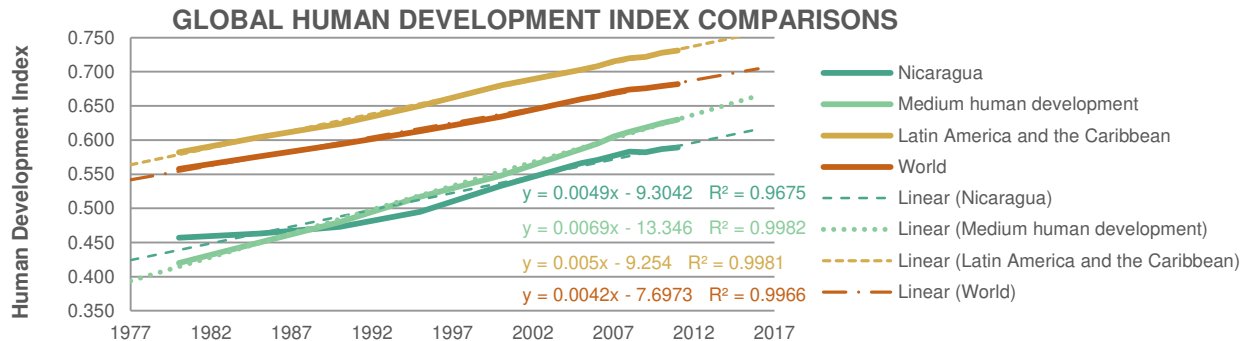- Linear (Latin America and the Caribbean)
- Linear (World)

Figure 1: Global Human Development Index Comparisons adapted from United Nations Development Program

Development trends indicate that Nicaragua lags behind the rest of Latin America, and without strategy improvements, it will continue to trail behind. In contrast to other least developed countries where 30% of the population has access to electricity (Smith 2007, 174), 70% of Nicaragua's population has electricity (The World Bank 2012). In rural areas, 75% of the population has no access to grid electricity (Tecnosol 2010). This presents a challenge to develop affordable products that meet basic needs such as electricity.

2: LITERATURE REVIEW

The literature review consists of four main topics—humanitarian design, social entrepreneurship, sustainability, and participatory design methods. Many of these categories overlap within a single piece of literature, but the purpose of this literature review is to establish a foundation of humanitarian design tradition, to track its recent shift from charity to microenterprise development, to examine the criteria used to ensure sustainable outcomes, and finally to discuss current methods for participatory design practices.

Globally conscious design drives Victor Papanek's discussion in *Design for the Real World* where he describes the value of indigenous knowledge in humanitarian design work. Papanek's exhortation reverberates in the prose of contemporary authors such as Project H Design's Emily Pilloton who emphasizes designing "with communities, rather than for clients" (20). In the same way, four of Paul Polak's Twelve Steps for Practical Problem Solving require designers to draw from the experience and context of users (13-14). Context-appropriate solutions also appear in the renowned writings of E. F. Shumacher (1973) and C. K. Prahalad (2009). While Schumacher emphasizes "intermediate technologies" and decentralization as solutions to propel developing countries (260), Prahalad focuses on three A's—Affordability, Accessibility, and Availability—for Multi-National Corporations (MNCs) to succeed in creating products for BOP consumers (19).

To ensure that these solutions for developing countries endure, Dr. M.R.M. Crul and J.M. Diehl describe best practices for development by organizing their handbook with the sustainable triple bottom line: people, planet, and profit. Various means and methods to engage social players surface in design toolkits from IDEO and frog as well as papers and methods from Liz Sanders, Ezio Manzini, and Lextant. User participation forms the common thread in the literature review. From the exhortations of humanitarian designers such as Victor Papanek, Paul Polak, and Emily Pilloton to the practical guidelines

established in the *Design for Sustainability* manual, IDEO's HCD Toolkit, and frog's Collective Action Toolkit, a common theme reverberates: users "are experts on their own experiences" (Visser, et al. 2005, 10). In the next chapter I explain the research methods and tools used to uncover this expertise.

3: RESEARCH METHODOLOGY

Building upon a base understanding of relevant design theory, the primary research consists of expert interviews and a field study. The expert interviews involve humanitarian design practitioners and members of community development associations. The four week field study includes 12 volunteer participants from the villages of Balgüe and Pullman in Ometepe. The study's design focuses on identifying community stakeholders and discovering the broad external forces influencing development as well as the tacit and explicit needs of community members and the local perceptions of microcredit.

For the field study, many participatory design theorists and practitioners agree on three main phases of participatory design—prime, dream, and create (Levitt and Richards 2010, 25). The prime phase is typically used to prepare participants through self-documentation. Using techniques such as day-in-the-life journals and independent photo documentation provides insight into daily activities, routines, and needs of end users. Inspired by an example in IDEO's HCD Toolkit, the photo kit includes prompts for each photo (e.g. "This is what's in my pocket"). Additionally, the diary includes one side for typical daily activities while the other side describes a typical week. These techniques also encourage end users to observe and reflect on their actions, priming them for future discussions.

Sanders et al. (2010) use four phases—probe, prime, understand, and generate. The understand/dream phase uses interviews to understand values, aspirations, and politics within a given community. The interviews begin with specific questions related to artifacts and daily routines, and after discussing these specifics, participants address general topics relating to the community. The metaphor of a human body portrays distinct stakeholder functions in the community such as activists (the mouth), visionaries (the eyes), workforce (hands and feet), etc. Finally, the interview concludes with probing questions intended to uncover deeper insights relating to perceptions of microcredit.

The final create/generate phase incorporates two-dimensional and three dimensional mapping and model-making tools. These tools further facilitate the sharing of tacit knowledge between non-designers and design researchers (Sanders 2002, 3). Using worksheets from IDEO's HCD toolkit, factors and forces are mapped from initial domestic sphere into broader spheres such as the community (Balgüe), the region (Ometepe), the country (Nicaragua), and the world. Additional brainstorming exercises such as forced association are used to access "indigenous knowledge" regarding available materials (Takamura 2012). Community design review and validation ensures that local perceptions of concepts surface early in the design development to prevent failure in later stages of development.

4: ANALYSIS AND FINDINGS

Mapping community leaders and influencers helps address the first research focal point regarding stakeholders. In Ometepe participants identified stakeholders from three major categories—social-political organizations, NGO agencies, and local religious institutions. The diversity of responses suggests that widespread endorsement and awareness campaigns across multiple channels are needed to influence members of small communities in Ometepe. Regarding purchasing decisions, results from the

resource flow activity indicate that most couples collectively decide on major purchases relating to health, home improvement, transportation, and income generating tools and livestock.

Studies from the self-documented prime phase offered insight into specific needs. Themes emerged based on environmental and cultural factors that skewed schedules toward more activity in the early hours of the day with a siesta or rest time in the middle of the day. Additionally, married women in the community spend a large portion of their time on domestic tasks including a few hours each week dedicated to washing clothes by hand. Finally, most participants eat dinner around sunset (6pm) and spend 2-4 hours awake after sunset. These scheduling insights reveal peak hours for power consumption—near siesta time and after sunset.

In addition to the written diaries, the photo journals helped provide a deeper understanding of the needs and desires of participants in the community. Explicitly, participants answered prompts for "This is something I need" by photographing fluorescent lamps and modes of transportation. Additionally, for another direct desire prompt, "I wish I had this," participants captured photos of various tools including Dremels, machetes, computers, and stovetop ranges. One theme arising from these selections is the desire for devices that consume energy, suggesting an opportunity for a packaged power generation and consumption platform. In addition to these tools, participants responded to the favorite device prompt by photographing televisions, mobile phones, and other entertainment and community connection devices.

Beyond the objective data, aspirations encapsulated in the photographic journal are further articulated with the aid of aspiration cards. Most of the aspirations included practical money-making items such as farm animals as well as various means of transportation. Families living farther from the main road and power lines emphasized energy aspirations through lamps, TVs, and radios, stating: "these need power...our dream is to have power one day." In the same way, projective stimuli photos revealed practical aspirations for refrigeration, transportation, and sanitation. Mapping the income and expenses for a household required patience as participants painstakingly listed incomes ranging from 350 to 1000 Córdobas ($15-$40) per week. Additionally, many participants struggled with the abstract nature of mapping external factors and forces affecting their communities.

Product misuse stems from a root problem of value, and in desperate scenarios, immediate needs can lead to cannibalizing products for their parts and materials. If a user is given a product or purchases a product at a subsidized cost, the sale of the product's parts and materials offers an immediate profit. On the other hand, the sale of parts and materials for an unsubsidized product constitutes an immediate loss. This enterprise model not only incentivizes intended product usage but the act of purchasing also instills dignity and power. Determining the value for a given product in the eyes of the consumer requires circuitous probing, but can help identify answers to "questions about risk, insurance, guarantees, trade-offs, return on investment, and future behavior" (IDEO 2011, 60). This exercise corresponds with Lextant's projective stimuli activity, where users are asked to pick one option from an array of three words or photos. This reveals priorities, and more importantly, the user's specific values which affect the purchasing decision. For the Ometepe case study, the discussion of each decision's rationale provided the following insight: participants desire products and services that offer a return on investment more than products and services that improve the quality of life.

4.1. DESIGN OPPORTUNITIES & CRITERIA
Interviews, photo journals, and aspirations indicated a desire for improved health care, transportation, water purification, clean burning stoves, and electricity. Specifically, there is an opportunity to design a

methodology for working with community members to develop low-cost electrical generators. Average electrical bills for residents of Ometepe range between $5-10/month, and designing for payback within a year (Polak 2008, 104), the cost of the wind power generator would have to be between $60-$120 dollars. According to other wind power manufacturers in Nicaragua, small households consume about 150 kWh per year or 410 Wh per day (Blue Energy), or roughly 8 hours of steady power from a 50W generator.

5: DESIGN & CONCEPT DEVELOPMENT

With an understanding of user values and consumption needs, idea generation began by incorporating inexpensive and available materials such as five-gallon water jugs, PET water bottles, PVC pipe, wood, fabric, and bicycle parts. We discussed cost and manufacturing feasibility using locally available tools and resources and collectively decided to pursue a horizontal axis turbine to satisfy existing perceptions of functionality at an affordable price. To build a field prototype, I constructed two sets of rotors from PVC pipe and PET water bottles. In addition to the performance improvements of the PVC rotors, their appearance connotes a more intentional design whereas the PET bottle rotors suggest a do-it-yourself product made from garbage. Issues of aesthetics recall Victor Papanek's Tin Can Radio project for UNESCO in the 1960's. Papanek defended the radio's "ugliness" claiming, "painting it would have been wrong...I have no right to make aesthetic or 'good taste' decisions that will affect millions of...members of a different culture" (227). In this case study, Papanek's justification for the radio's ugliness has the following weakness: the aesthetics and desires of developed countries impact the inhabitants of remote islands such as Ometepe through Friedman's flatteners. Evidence from the dream phase suggests that even the poor rural farmers have access to Western media, and responses from the aspiration cards activity suggest a desire for refined acquisitions such as a "*nice* car" and a "*better* house" (emphasis mine). While Papanek's emphasis on affordability commends his solution, his disregard for desirability limits its effectiveness and adoption. To achieve desirability, the design combines indigenous symbols with Western aesthetics by using Nicaragua's flag for color inspiration and creating a symbol of pride.

5.1. CATALYTIC DEVELOPMENT
To expand the prototype into a working business requires an outside DREAMdev design consultant to act as a catalyst in the community's development by facilitating participatory methods through a process coined Catalytic Development (Figure 2). The consultant establishes contact with a Nongovernment Organization (NGO) operating in a targeted community. The consultant offers a partnership to deliver technical design services in exchange for access to community "champions," who act as a liaison between the community and the NGO (Motz 2012). Participation from NGOs is incentivized by these technical design projects, which open the door for social development NGOs to access technology and innovation grants provided by large aid agencies. The existing NGO relationship with the community expedites trust building and fosters a perception of legitimacy within the community.

Figure 2: Catalytic Development

After establishing an initial relationship with an NGO, government, or community organization, the champion enables the DREAMdev consultant to embed within a community and facilitate the participatory design study. Next the consultant primes and further assesses the feasibility and need within the community, and then the consultant partners with local entrepreneurs and community members to perform the three remaining phases of participatory design—dream, develop, and deliver.

During the develop phase, the consultant and community entrepreneurs co-design a prototype. The prototype helps community entrepreneurs garner seed capital from microfinance institutions (MFIs) for production in the Deliver phase. Results from the Ometepe case study indicate that farmers use microloans to purchase seed and fertilizer in hopes of increasing yield. While some participants reported modest interest rates of 3%, other participants remain leery of loans. This indicates a need for independent MFIs to build trust with members of the community. In these instances, the DREAMdev consultant acts as a liaison between financial institutions and local entrepreneurs, and loans are guaranteed by grants from larger aid agencies to mitigate risk and encourage adoption.

The goal of the Catalytic Development Process is to develop successful local businesses which garner interest from neighboring communities and promote the development of regional businesses, which in turn may grow into national and even global operations. In these development scenarios, design serves as a catalyst by transforming local potential into regional, national, and even global momentum.

5.2. PARTICIPATORY DEVELOPMENT FRAMEWORK

The Participatory Development Framework consists of five phases—plan, prime, dream, develop, and deliver (Figure 3).
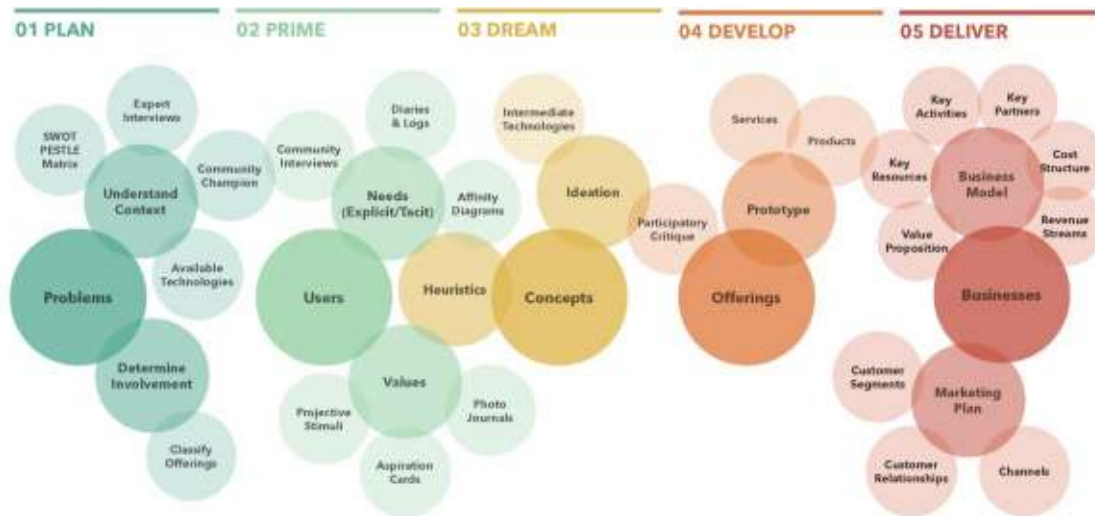
Figure 3: Participatory Design Framework

During the Plan phase, the problems and objectives of the project are defined. In order to gain a deeper understanding of the problem, the macro and micro contexts of a community are investigated using PESTEL and SWOT analysis. Examining the context from a macro perspective provides guidance on the external factors affecting a given community, while micro investigation reveals the values and existing conditions that direct the design of cultural probes. At this time partnerships are formed with local stakeholders who provide access to local community champions.

The Prime phase focuses on preparing users, also known as participants, for interviews by exploring their needs and values through cultural probes and interviews. These probes may include workbooks, logs/diaries, day-in-the-life schedules, and photo journals (Levitt and Richards 2010, 27). While these probes provide tangible data on daily activities and needs, they also prepare participants to consider values and aspirations, which are further engaged in the Dream phase.

The Dream phase seeks to draw out the broader aspirations of users based on their needs and values. With the aid of aspiration cards, users describe their dreams for future businesses and acquisitions. In-context interviews also reveal tacit needs and expose participants' perspectives on existing solutions and technologies. With the aid of projective stimuli, participants explain their preferences and values regarding new purchasing decisions. Expenses and income are investigated through resource flow activities, and users also map external factors and forces to understand spheres of influence. Patterns of insight gleaned from the user's context, needs, values, and aspirations establish heuristics in the form of design opportunities and criteria, which guide the creation of intermediate technologies or solutions. The designer expresses users' dreams for these potential solutions through concept development sketches for participatory design reviews, which examine each participant's visceral and reflective responses to the generated concepts. Feedback from this participatory critique guides design refinement and development of prototypes for further iterations.

Depending on the complexity and interactivity of the project, concept prototyping may include participatory activities. For example, service offerings may benefit from user input through small-scale mockups, service or experience prototypes, and role-playing activities. The participatory development of prototypes in the field also helps address feasibility concerns regarding material, part, and tool availability.

The final Deliver phase includes an implementation plan for pricing, promoting, distributing, financing, and maintaining a given product or service. This phase is essential to ensure the holistic

7

success and long-term sustainability of a given project. Tasks during the Deliver phase include business model development using tools such as the Business Model Canvas with linkages to effective financing mechanisms as well as unique and desirable offerings. Additionally, a marketing plan encompassing the 4P's facilitates the diffusion of innovation with strategies specific to a given context.

6: CONCLUSION

The intent of this project was to develop a participatory design framework to catalyze development in emerging economies using the case study of Ometepe, Nicaragua. During the course of the four week study with seven families, participatory design methods and tools uncovered both tacit and explicit needs for affordable and decentralized energy solutions. After I sketched several solutions, participants reviewed the concepts and articulated their perceptions and concerns. I constructed a field prototype using locally available materials and tools, and the prototypes revealed a shift in emphasis from Papanek's traditional affordability criteria to a holistic set of heuristics encompassing aspirational aesthetics. From the Ometepe case study I derived the Catalytic Development process and the Participatory Development Framework for emerging economies. The two P's and three D's of the framework illustrate the specific tasks and tools required to define a design problem, to prime community members for involvement, to develop a prototype of the solution, and to deliver a business from that solution. Employing this framework on future humanitarian design projects encourages user ownership of the final product or service offering while ensuring that both tacit and explicit user needs are met.

REFERENCES

Blue Energy. *Answers to Common Questions.* http://www.blueenergygroup.org/spip.php?article234 (accessed July 21, 2012).

Friedman, Thomas. *The World is Flat: A Brief History of the Twenty-first Century.* New York: Picador/Farrar, Straus & Giroux, 2007.

IDEO. *Human-Centered Design Toolkit: An Open-Source Toolkit To Inspire New Solutions in the Developing World.* IDEO, 2011.

Levitt, Mariah, and Scott Richards. "Beyond Observation: Leveraging User Expertise Through Participatory Design." *Innovation* (Industrial Design Society of America), Spring 2010: 24-27.

Motz, Cacci, interview by Tim Tocci. *Interview on Community Development in Afghanistan* (April 18, 2012).

Papanek, Victor. *Design for the Real World: Human Ecology and Social Change.* New York: Academy Chicago Publishers, 1985.

Pilloton, Emily. *Design Revolution: 100 products that empower people.* New York: Bellerphon Publications, 2009.

Polak, Paul. *Out of Poverty: What works when traditional approaches fail.* San Francisco: Berrett-Koehler Publishers, Inc., 2008.

Prahalad, C. K. *The Fortune at the Bottom of the Pyramid.* New York: Pearson Hall, 2009.

Sanders, Elizabeth B.-N. "From User-Centered to Participatory Design Approaches." In *Design and the Social Sciences: Making Connections*, edited by Jorge Frascara, 1-8. London: Taylor & Francis, 2002.

Sanders, Elizabeth B.-N., Eva Brandt, and Thomas Binder. "A Framework for Organizing the Tools and Techniques of Participatory Design." *Participatory Design Conference.* Sydney: ACM, 2010. 195-198.

Schumacher, E.F. *Small is Beautiful: Economics as if People Mattered.* New York: Harper Perennial, 2010.

Smith, Cynthia E., ed. *Design for the Other 90%.* New York: Cooper Hewitt Museum, 2007.

Takamura, John, interview by Tim Tocci. *Participatory Methods in Humanitarian Design* (May 9, 2012).

Tecnosol. "Case Study Summary: Tecnosol Nicaragua." *Ashden Awards.* May 2010. http://www.ashden.org/files/reports/TECNOSOL%20case%20study.pdf (accessed March 8, 2013).

The World Bank. "World Development Indicators." The World Bank, 2012.

Visser, Froukje Sleeswijk, Pieter Jan Stappers, Remko Van Der Lugt, and Elizabeth B.-N. Sanders. "Contextmapping: experiences from practice." *Make Tools.* 2005. http://www.maketools.com/articles-papers/Contextmapping_SleeswijkVisseretal_05.pdf (accessed September 26, 2012).