A Systematic Methodology for the Development of Enterprise at the Base of the Economic Pyramid

Dr. Brad Rogers, Arizona State University, Polytechnic campus

Brad Rogers is an Associate Professor in the Department of Engineering at the Polytechnic campus of Arizona State University, and is the Director of Research and Development for GlobalResolve, an interdisciplinary social entrepreneurship initiative at Arizona State University that seeks to leverage the skills and talents of students and faculty at ASU and international partner universities to develop sustainable enterprises in the developing world. While at ASU he has taught more than 40 different courses at the graduate and undergraduate levels in engineering and in social entrepreneurship. He has also worked in industry in both conventional and alternative energy conversion systems. Since 2007 in his capacity within GlobalResolve he has initiated programs and managed in-country student teams from ASU and partner universities in the developing world that have worked on multiple projects. Examples include the design and construction of a microbial fuel cell composting latrine in West Africa, installation of a gelled ethanol plant that produces clean cooking fuel in a rural Ghanaian village, the development of highly efficient gelfuel stoves, a thermoelectric driven sustainable lighting system for the BoP market, a prototype refrigerator that runs solely on charcoal, the distribution of a water filtration system for the impoverished Ghanaian village of Fawomanye, and several other projects.

Dr. Kiril D Hristovski, Arizona State University, Polytechnic campus
Dr. Nalini Chhetri, Global Institute of Sustainability, Arizona State University
Prof. Benjamin L. Ruddell, Arizona State University
Dr. Mark R Henderson, Arizona State University, Polytechnic campus

Mark Henderson is Professor of Engineering and Associate Dean of the Barrett Honors College at Arizona State University. He holds a Ph.D. degree in Mechanical Engineering from Purdue. He is a co-founder and Director since 2006 of GlobalResolve (http://globalresolve.asu.edu), an ASU program to provide sustainable technological and economic development to base of the pyramid communities primarily in Ghana, Mexico and Arizona. GlobalResolve has worked in several villages on clean water, off-grid electricity generation and smokeless cooking systems among other projects, with the express goal of helping communities use these technology solutions to create business ventures. His international design interest began by starting the Global Engineering Design Team from 1998-2008 and the Nomadic Design Academy with 6 other universities from 2002-2004. He is also a co-founder of InnovationSpace (http://innovationspace.asu.edu), a multi-disciplinary product development experience and led the development of a new (2011) Technological Entrepreneurship and Management program on ASU's Polytechnic campus in which the GlobalResolve courses reside leading to major, minor and certificate in Social Entrepreneurship. Although his early research was in geometric modeling, his recent publications center more on global design education, design thinking and curriculum development, especially around social entrepreneurship.

Mr. John H Takamura Jr, Arizona State University

John Hiroomi Takamura Jr. Associate Professor of Industrial Design, The Design School, Herberger Institute for Design and the Arts, Arizona State University

Bringing over 17 years of industrial design practice experience, John Takamura has been instrumental in implementing brand and product development programs in both Asia and North America. Early in his career, John was hired by ODS, an international market research and design consultancy, and served as the Design Director for their Industrial Design Division under the guidance of international designers Luigi Colani (Renowned Transportation Designer, DE), Hans Muth (Former BMW Chief of Styling, DE), and Barry Weaver (Co-founder Roberts Weaver Group, UK). John later joined Sharp Corporation's elite advanced design team in Tokyo where he helped to develop the Sharp ViewCam concept that would later become a standard video camera configuration in the global market. Upon returning to the U.S. John

established Takamura Design, a trans-disciplinary design office, servicing clients in Asia and the U.S. from the San Francisco Bay Area. In 1997 John joined Fitch Inc. to establish and manage the Fitch office in Japan. Serving as Vice President of the Japan office, John was involved as the Design Director, Project Manager, and Account Manager for numerous Japanese companies in the automotive, electronics, consumer goods, and service industries, and also served as manager of the Fitch Japan-based innovation lab called the MadLab (Marketing and Design Laboratory). One of John's most notable programs was the revitalization of the Nissan Motor Company brand. John served as global manager for the international (U.S., Japan, UK) trans-disciplinary design and research team responsible for the creation of the new Nissan brand mark and corporate logo design and branding guidelines. John returned to the U.S in 2001 as Vice President and Director of Client Services for product design at the Fitch San Francisco office. John was responsible for the development and management of all Japanese accounts, and some key accounts within the U.S. consulting in the in-car telematics and computing and consumer computer arena. After leaving Fitch Inc. John was hired to develop and lead a trans-disciplinary design team at X Product Development, a division of Xyron Inc. in Scottsdale Arizona. His responsibilities involved the management of the entire creative team in both industrial design and visual communications as well as to manage the Xploratorium, an innovation lab for creative product development and engineering. With a major in industrial design, John received his BA in design from the University of California, Los Angeles (UCLA) and furthered his studies at Art Center Pasadena. He received his Master's of Science in Design degree in Human Factors in industrial design from Arizona State University. John is currently an Associate Professor of Industrial Design in The Design at the Herberger Institute for Design and the Arts at Arizona State University where he teaches both lower and upper division BSD (Bachelor of Science in Design degree) industrial design courses and MSD (Master's of Science in Design degree) design research and MID (Master's of Industrial Design) graduate design courses. John is active in developing corporate sponsored university research, industrial design, and branding programs within various consumer product and service industries. John works with the First Innovations American Indian Studies program at ASU in teaching classes on American Indian Entrepreneurship for Sustainability. John also serves as Director of Design for GlobalResolve^{TM}, a social entrepreneurship program at the College of Technology & Innovation at ASU's Polytechnic Campus where he is responsible for ethnographic research and design programs for products and services intended for the BoP (Base of the Pyramid) market in the developing world.

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Abstract

Challenges associated with extreme poverty have proven to be among the most intractable in the world, and, while engineers are critically important to the process of its alleviation, meaningful progress requires international, interdisciplinary teams that not only represent cultural and socioeconomic diversity, but work as one toward a commonly understood goal. When assembling such a diverse team, it is necessary to establish a fundamental and easily communicable strategy that highlights the importance of team members' roles as well as their challenges and constraints. This strategy is at the intersection of the diverse bodies of knowledge that each member brings and defines the "common knowledge" required to function as a unified and focused team. Using this strategy, a systematic methodology was developed at Arizona State University through an evolution and maturation of the GlobalResolve initiative, a program established to enhance students' educational experience and based on the nexus between engineering for the developing world and social entrepreneurship. The development of the methodology was approached by considering enterprise development at the Base of the Pyramid (BoP) as a complex systems engineering problem. In this context, the word "system" means an integrated set of interacting people, policies, procedures, and components that react to an input and produce a predictable output. The inputs to this system are the skills and talents of people living at the BoP, and the output is a successful enterprise that generates economic activity, provides employment, and improves people's lives. An important outcome of this effort has been to parlay this intellectual and experiential process in the development of curricula and academic programs in social entrepreneurship both directly within engineering programs and within the wider academic infrastructure.

Introduction

The challenge of meaningfully improving the quality of life for the billions of people living at the Base of the Pyramid (BoP) has proven to be a most difficult problem. In spite of ambitious and well-funded programs, such as the United Nations Millennium Development Goals initiative, almost half of the world's population continues to live on less than $2 per day[1]. This problem is especially profound in sub-Saharan Africa, where the rate of extreme poverty, defined by those living on incomes of less than $1.25 per day, has remained around 50% of the population for the last 30 years[2]. At the same time, the cascading events of the last decade have demonstrated that the future security and well-being of the entire world is inexorably tied to improvements in living conditions of poor and hopeless people in regions that are vulnerable to extremism. In the past two decades, practitioners have made meaningful and measurable progress on poverty by focusing on the development of enterprise among people living in

extreme poverty[3,4,5], and there is now both a need and an opportunity for universities to focus their substantial assets on the development of this field.

Degrees both at the undergraduate and graduate levels are differentiated by the knowledge that is imparted through standard curricula, a student is required to demonstrate mastery of a set of topics at a level appropriate to the degree being granted; or in academic phraseology, mastery of a "body of knowledge" specific to his/her field. This body of knowledge is defined and articulated by experts, consisting of recognized academics and respected practitioners in the field, and forms the underpinning of academic curricula. The primary objective of these experts is the development of curricula and transfer of the “body of knowledge”. In brief, the establishment of academic programs in any field requires the following components:

1. An accepted body of knowledge which constitutes the field.
2. A set of academicians and practitioners who are recognized and respected as experts in the field.
3. Curricula, based on a consensus of these experts, which develop breadth of expertise, followed by specialization is particular aspects of the field.

Unfortunately, the development of the academic underpinning for programs in enterprise development at the BoP has proven to be very challenging because none of the three requirements listed above are in place. There is no universally accepted terminology or language that embodies these efforts, let alone an accepted body of knowledge. Nor are there standards that define emerging academic programs, and those that do exist operate in virtual vacuums. Fundamentally, even though a great deal of experience and expertise in solving problems at the BoP exists within universities, there is no traditional manifestation in form of academic programs.

The GlobalResolve Initiative at ASU

Arizona State University (ASU), along with programs at a few other universities, have sought to understand, develop and deploy an enterprise-based approach to poverty reduction within an academic framework. At ASU and at partner institutions the principles of systems engineering are being applied to guide, develop and organize transdisciplinary curricula through GlobalResolve, a social entrepreneurship program that was initiated by a diverse group of faculty in 2006 with the goal of bringing together international, interdisciplinary, intercultural and inter-socioeconomic teams to focus on catalyzing the development of enterprise at the BoP. A fundamental premise of the GlobalResolve program is to reject myopic and discipline specific attempts at poverty reduction that have not worked in the past, but instead to embrace the complexity of the problems and function within this framework.

The thinking leading up to the framework is a universal acknowledgement that the current problems that society faces are interrelated and partly the consequence of the inadequacy to think

from a complex systems approach. The concept of solutions based development especially for the BoP population has been around for over half a century but continues to provoke cynicism among practitioners, scholars and policy makers for its failure to have sustainable impact as it continually relies on disciplinary approach. A more innovative but challenging model is a close coupling of "knowledge intensive" model that relies on scientific and technical information with that of "experiential learning" that focuses on solutions that are nested in specific cultures and practices.

The notion of rethinking current educational models to harness knowledge that is both experiential and technical requires a new way of thinking that is supportive of crosscutting changes in teaching and learning about problem solving. This kind of thinking also requires an acknowledgement of the complexities of human-environment and technological systems that solutions are embedded in. That "knowledge first" views of science and engineering and "experiential-learning" or pragmatic views that emphasize solution-based approach are different and distinct but must be learned in tandem is the basis of solution based approaches to systems development. This education model needs to incorporate analytical and practical skills that allow for critical engagement of student body with a distinct problem-solving angle that emphasizes the need to work across intersection of research and practice. Often the inertia is in understanding a problem well but the subsequent inability to inform and mobilize solutions for actions across a scale and range is also significant and addressing it properly can make tangible differences.

The challenge remains on how knowledge systems that are locked-in across various cultures and traditions can be harnessed to gain useful insights to address technological and engineering problems, including understanding cultures and their views and perception of solutions. It is also the ability to reimagine ways to communicate this complexity. While the case can be made that problems cannot be solved by technological fixes and or market alone, their contribution is enhanced if social and cultural context within which they are resolved are given more significance than they currently are. Therefore nesting technological problems in cultural and social fabric of life in specific locales enhances and opens up students to different ways of knowing.

As the GlobalResolve initiative has evolved, the need for (1) embracing the environment that exists at the BoP, and (2) developing the capacity to better understand the complexity of the problems associated with extreme poverty, has become clear, both from the perspectives of on-the-ground enterprise development and the initiation of organized academic programs across multiple disciplines at ASU and partner institutions. At ASU, this challenge was addressed by taking a systems viewpoint and considering at the goals of the GlobalResolve initiative at the most basic level. In this case, the inputs to the system are the skills, talents and aspirations of poor people living at the BoP, and the output from the system is a successful enterprise that generates economic growth and improves people's lives.

The GlobalResolve Methodology

In order to define and develop the enterprise based approach to poverty reduction as a recognized academic discipline the skill sets that are required of graduates must be established. This requires defining a methodology that reflects successful practice and establishing where the evolving body of knowledge fits within the larger human body of knowledge. (More specifically: Is an enterprise-based approach to poverty reduction a branch of an academic program that already exists?) This is an important intellectual exercise because, except in very rare cases, all new branches of learning evolve from existing disciplines, and develop within the framework of these existing disciplines. Questions that must be addressed are:

1. What is an enterprise based approach to poverty reduction?
2. What are the details, or the methodology, of the practice of enterprise based approaches to poverty reduction?
    a. Based on this methodology, what are the fundamentals tasks necessary to effectively solve BoP problems?
3. How do these fundamentals fit within the existing human body of knowledge?

Because of the realities associated with such a developing field, answers to such questions are both elusive and evolving. Within GlobalResolve the following have been proposed:

1. What is meant by an enterprise based approach to poverty reduction?

The enterprise-based approach to poverty reduction assembles a team of stakeholders to establish profitable businesses at the BoP level that result in long-term sustainable economic activity that employs and improves the lives of people previously living in abject poverty.

2. What are the details of the methodology?

Effective solutions that result in poverty reduction and improved lives at the BoP are much more likely to be achieved when effective thought processes are focused on the problem. The most effective means of problem solving is a systematic approach broadly referred to as the scientific method that, in this case, is reduced to the following steps[6]:

1. Define the problem
2. Solve the problem
3. Check the solution

Any methodology proposed for an enterprise-based approach to poverty reduction should reflect this fundamental structure. Such a methodology has been developed within GlobalResolve, and is currently illustrated in Figure 1.

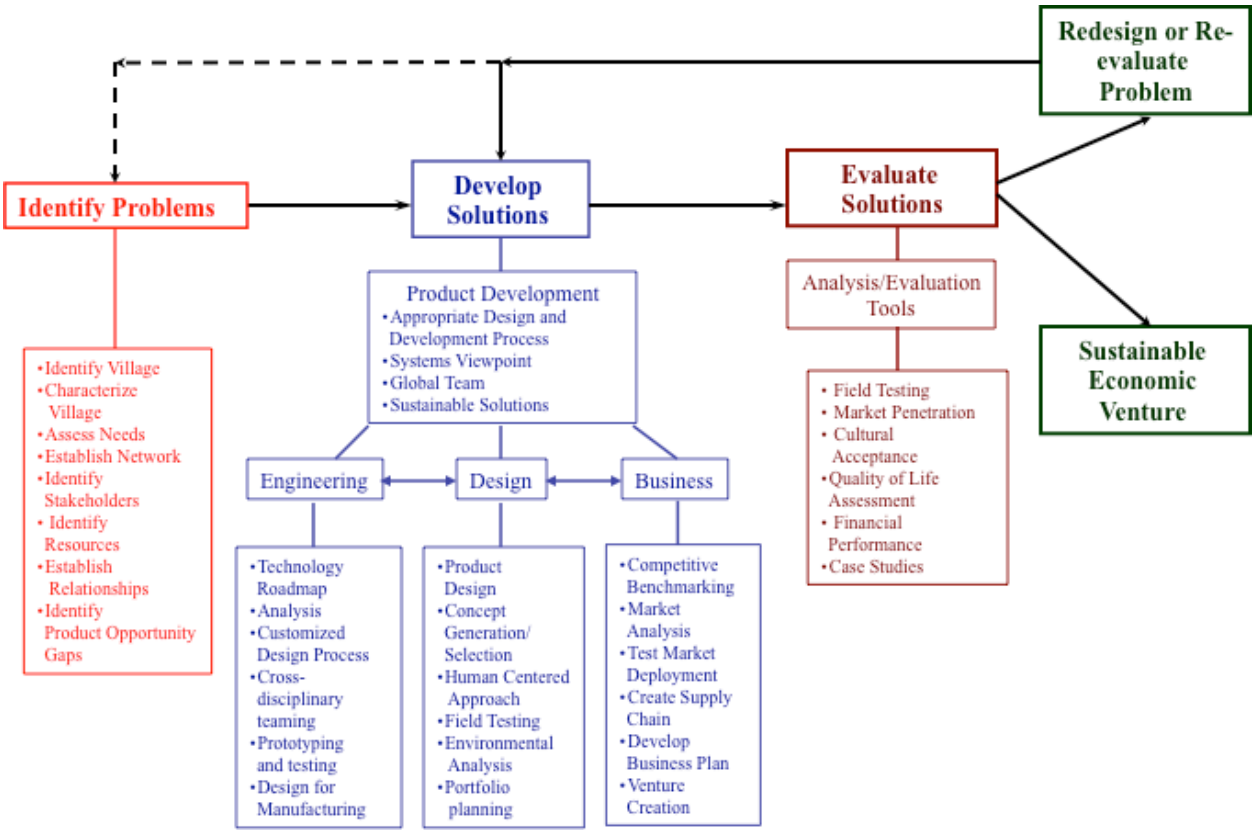

Figure 1. The GlobalResolve Methodology for the Enterprise-Based Approach to Poverty Reduction

The diagram in figure 1 simply reflects a sound and systematic problem solving strategy, but it also illustrates the complexity and interdisciplinary nature of this approach. This becomes especially apparent when the details of each of these fundamental tasks are considered. As an example, a needs assessment within a rural village requires establishing relationships and trust with villagers. To do this a team tasked with assessing these needs must be assembled. This is likely to include an advance team (potentially local residents with existing relationships) tasked with establishing this trust, and facilitating village meetings. The actual needs assessment may occur during village meetings, but the expertise required to carry out the task includes (but is not limited to) local languages, ethnography, social science, cultural expertise, gender issues, science, engineering, technology, and business. The talent required for this effort is completely different than that required to design a BoP product, or to monitor the long-term performances of village businesses. In fact, each task identified in the methodology requires a similarly diverse team. The result is that successful establishment of an enterprise that leads to poverty reduction at the BoP level requires a diverse team of international, and interdisciplinary professionals all working toward a commonly understood goal. In addition, because of the complexity of issues that must be addressed, individuals with virtually any background have expertise to offer to the development team.

3. How do these fundamentals tasks fit within the existing body of knowledge?

The enterprise-based approach to poverty reduction draws expertise from many diverse disciplines. For example, a *partial* list of individuals that is needed for critical aspects of these projects from time to time includes all types of engineers, natural and social scientists, medical professionals, business and marketing experts legal experts, cultural anthropologists, and experts in local languages and cultures. It is not possible, or even desirable, for a single individual to possess all of the background necessary to effectively carry out the enterprise development process. As a consequence, effective programs require that the interdisciplinary nature of the field be embraced, and that the programs are staffed by faculty that reflect the broad nature of the field.

Given the interdisciplinary nature of these problems there are no obvious existing programs or departments that are natural fits for this evolving field. And in general, few academic organizations understand the need for development of this field because traditionally these disciplines act independently since other disciplines are conditioned and ready to take a hand-off of a product or need and make progress. In this field it is not clear who, if anyone, is ready to collaborate or take a hand-off because the multiple disciplines all have "pedigreed" responsibilities that either ignore or devalue work at the BoP. The result is that colleges, departments and faculty that embrace and celebrate the interdisciplinary nature of enterprise-based approaches to poverty reduction while simultaneously developing programs that provide the necessary common knowledge base for all experts working on these problems have the opportunity not only to define this emerging discipline, but to meaningfully affect the elusive problem of extreme poverty.

Based on these premises, the following principles are suggested for the academic development of programs for enterprise-based approaches to poverty reduction:

1. The principle common to all specialists working on the enterprise development team is a rigorous and scientific methodology for the enterprise-based approach to reduction of poverty such as illustrated in figure 1.
2. Research directed to the establishing and expanding the body of knowledge for enterprise-based approaches to poverty reduction should be guided by the principles as outlined in the strategy of GlobalResolve or similarly rigorous methodology.
    a. Both applied and fundamental research directed to the solution of problems should be continuously reviewed and critically evaluated by team members to assess the broad impact and applicability of new technologies and procedures.
    b. The entire team benefits greatly from an understanding of the capabilities and limitations of the fundamental research and from each other.
3. Academic institutions educate and grant credentials to professionals who make up a *portion* of the enterprise-based approach to poverty reduction team. However, all

individuals that seek expertise and credential in this area must be versed in the fundamental methodology.

4. All educational programs should be dedicated to the axiom that each team member on the enterprise development team must, to the extent that their background allows, be educated in the overall scientific methodology, and to understand where their particular expertise fits into this general picture. The justification for this axiom is based on two sub-postulates:
    a. Effectiveness is maximized through improved communication and understanding between specialists working toward a common goal.
    b. As the careers of individuals' progress, their responsibilities evolve and expand into management of the teams and projects, requiring a knowledge and appreciation of the complete process.

Results and Accomplishments

In the Fall of 2007 faculty at ASU began offering courses to students across the university based on GlobalResolve principles. As the program evolved and the methodology was clarified, these courses have been organized within the framework of the GlobalResolve methodology. Over the last three years an average of about four courses per academic year have been taught consisting of offerings from the Department of Engineering, the School of Sustainability, the School of Design, and the Honors College. However, in most cases the courses have consisted of interdisciplinary groups of students irrespective of specific department affiliations. These classes have ranged from sophomore through graduate levels, and to date GlobalResolve projects and classes have involved approximately 500 students and 25 faculty members from ASU and both domestic and international partner institutions. Examples of international partnerships and projects include:

- IIT Dehli,
    - Received joint funding to co-develop public domain water and sanitation courses involving student and faculty exchanges between ASU and IIT Dehli.
- Kwame N'Krumah University of Science and Technology (KNUST)
    - Jointly working with faculty and students to develop a gelfuel business in the Kumasi metropolitan area.
- Kumasi Polytechnic and the Center for Energy, Environment and Sustainable Development (CEESD)
    - Developing an improved fish smoker for impoverished coastal villages in Ghana, as well as a weather warning system for traditional fishing fleets in these villages.
- Pure Home Water, Ghana
    - Along with the University of Massachusetts developed and installed a microbial fuel cell based composting latrine and rural Ghana
- Tec de Monterrey

    - Partnered to form a GlobalResolve satellite organization in Tolucca to work together on creating a sustainable in the adjacent barrio of San Antonio Buena Vista.
- Aprotec Ghana
    - Co-developing local uses of sustainable materials for value-added exports and local construction materials.
- Macedonian State University "Goce Delcev"
    - ASU undergraduate students are engaged in investigating the water resources and trends in Macedonia.
- Bhagwan Mahaveer Viklang Sahayata Samiti (BMVSS) Jaipur, India
    - Along with MIT and Penn State evaluating the mechanical performance of the Jaipur foot prosthetic followed by design of an injection molding based manufacturing system
- Universidad Católica Santa María La Antigua in Panama
    - Discussing collaboration for training of water/sanitation professionals who will help the smaller communities in Panama
- University of Trinidad and Tobago
    - Developing a satellite GlobalResolve organization to form globally distributed teams.
- Society for Community Participation and Empowerment
    - Developing water purification solutions in Trichy, India
- Wello Water
    - Redesigning water carriers for more affordable shipping costs in rural India.

Partnerships such as described in the preceding list are examples of working beyond transdiciplinary teams that have been established within the local educational environment to include a much broader spectrum of stakeholders, and the capacity of universities to meaningfully improve the lives of very poor people through the development of enterprise depends on all stakeholders working together toward a commonly understood goal. However, these partnerships add complexity and challenges in communication and in maintaining focused efforts to maximize the talents and aspirations of individuals and organizations that make up the team. The GlobalResolve methodology described in this paper forms the management framework necessary to organize both joint educational efforts and the resulting project implementations.

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