

Design Thinking For the Poor: A Comparative Content Analysis of Development Challenges in OpenIDEO

Pierce Gordon

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Approved: _____

Dr. Dan Kammen

Professor, Energy and Resources Group

Approved: _____

Dr. Alice Agogino

Professor, Mechanical Engineering

Received by: _____

Kay Burns

Graduate Student Affairs Officer, Energy and Resources Group

University of California, Berkeley

Abstract

In the space of international development, experts aim to solve the problems of the poor with solutions driven by their expertise. Driven by technocratic problems, technologists driven to make the world a better place develop innovative technologies in widely disparate fields to serve the poor. Harnessing the process by which these technologies are made is impossible, however, by only considering the final product; one must consider the process by which the technology has been developed. This paper is a foray in analyzing the capabilities of design thinking in developing innovative, pro-poor products.

OpenIDEO is an online collaborative platform that harnesses crowd source design talent across the Internet to tackle difficult interdisciplinary problems. Many of their design Challenges have focused upon issues concerning impoverished communities. Challenges include human sanitation solutions, alternatives for serving maternal health issues with mobile technologies, affordable learning tools, and social business models to improve health, and other pressing global quandaries. The platform uses tens of thousands of designers to use Human-Centered Design (HCD) techniques to develop interventions for the public and private sectors, in the form of products and services which are catered specifically to users' needs. These products and services have considerable economic, social, and cultural benefits for firms and customers alike. In fact, the umbrella company IDEO has developed an HCD toolkit that helps designers develop products and services tailored for communities at the base of the pyramid. While the website creates innovative solutions to these varied problems, it also creates a rich trove of open-source data which shows the process by which these ideas were created.

The rich content of OpenIDEO affords a novel opportunity to study the presence and effectiveness of HCD metrics in practice.

This text serves two purposes:

- 1) To integrate the field of design thinking for the poor into the larger discourse of product and service development for the poor, i.e., Bottom of the Pyramid research,
- 2) To characterize and evaluate elements of HCD competence for development-based challenges in the OpenIDEO platform.

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Introduction

“Human knowing results from doing, from creating things, from constructing the world one lives in.”

Gambattista Vico, *The New Science*, 1744

In any field of study, people with expertise aim to use their experience to make their impact on the world. In the realm of international development, many people have aimed to address many of the problems of the poor by using their knowledge, their resources, and their technological capacity. However, in this the complex space of international development, with various actors, interests, and opinions, how do we solve such complex problems, while keeping everyone happy? The United Nations in 1990 thought they had an answer with the Millennium Development Goals (MDGs), which was a way to head the global community in comparable directions towards addressing global poverty issues. Other goals aren't as well known as the MDGs, but still have made a concerted impact towards directing development research and practice. Examples include the World Bank's 2010 estimate of 1.2 billion people living under 1.25 a day¹, World Energy Outlook's 2013 estimates of 1.3 billion people who do not have access to electricity and 2.6 billion people who cook with traditional biomass which cause health and climate hazards², and the World Health Organization's 2012 estimate of 2.5 billion people in the world without unimproved sanitation³. These massive issues serve two large purposes: simplicity and tangibility. The goals became a rallying call to anyone who sees the stark issues of international development, and who wants to make a change, but does not know where to start. The goals also act as a point of measurement; if one wants to solve issues of poverty, it makes sense to have some indicator as large as the global problems, but can be used to measure our collective capacity over time to solve the problem.

There have been many critiques of this technocratic approach to development: (1) the MDGs might be imprecise and ineffective agents for development progress⁴, (2) using technocratic goals to shape the political economy of development at the global level hinders critique of the methods and progress towards viable yet separate alternatives⁵, and (3) under the guise of benevolence,



Figure 1: d.light's S20. Source: dlightdesign.com.

act as another global system of control, on a similar level as neocolonialism, which keeps the global community from acknowledging that the real issues is the violation of the rights of the poor⁶. Though the critique of the reductionist and technocratic approach levels valid critiques towards the larger field of international development, this discourse is outside the scope of this paper. Regardless of if the technocratic view of development is the correct one; it has had a massive impact upon how communities currently interact with the poor. Studying these mechanisms, and how to change them for the better, is a worthy research endeavor, so we can understand what we can do better in the future. The technocratic view of development has had massive impact upon the problem creation, and thus the solutions, suggested by international development practitioners. Technologists, meaning engineers, entrepreneurs, marketers, anyone involved in the development of technological interventions, have aimed to solve the issues of poverty by using their varied expertise. Intriguingly, many novel technologies have been developed by technological experts to address issues of the poor. Notable examples include the d.light, shown in Figure 1, which is a low-cost light with fluorescent bulbs to give the very poor cheaper and more efficient illumination, developed by students involved with the Hasso Plattner Institute of Design at Stanford University. Currently located in New Delhi, Dar Es Salaam, Hong Kong, and Shenzhen, D.light has sold over 220,000 solar lanterns in 32 countries which reduce CO₂ emissions by at least 44,000 tons a year⁷⁸. Another example, in the field of infant health, is the Embrace, shown in Figure 2. It is a low-cost infant warmer made by students at the same school as a part of the influential class, "Design for Extreme Affordability." By the end of 2013, they had reached 50,000 low birth weight infants worldwide⁹. The Brilliance lamp, shown in Figure 3, was



Figure 2: the Embrace infant warmer. Source: <http://embraceglobal.org/>



Figure 3: Brilliance lamp, by D-Rev. <http://d-rev.org/products/brilliance/>

developed by Bay Area startup D-Rev¹⁰, is an efficient yet cheap lighting solution for infants with jaundice, with a projected cost of operation in the first year an order of magnitude less than jaundice lighting competitors¹¹. Another example, in the information and communication technology space, is the BRCK, shown in Figure 2. It is a battery-powered Wi-Fi hotspot, hard drive with cloud-based capabilities with a tough exterior and the capacity to be charged by anything from a USB port to a car battery¹².

Developed by the infamous Kenyan startup Ushahidi, known for developing an SMS and mapping technology which disseminated information about dangerous or needy citizens during the 2008

Kenyan riots, the BRCK is made for locales which experience brownouts or blackouts, but need consistent internet.

These innovative products have certain similarities worth mentioning. They are developed by individuals who see very specific problems the poor have, and aim to solve them with the end users in mind. These technologies are inherently disruptive, both to the communities in which they are intended and to the larger market of actors who aim to develop products for the poor. These innovators are capable enough to solve the problems with technical expertise, yet small enough to be interested in the smaller markets of the poor with particularly nuanced issues.

Many more of these products exist, and are continuing to be made and marketed to the poor.

However, there is an interesting artifact of the communities which make these products; they tend to be disciplinarily and geographically separated. This means, the technologists are likely to study interventions that are in the same intervention space, or the same geographical location. For example, the manufacturers of an infant health intervention, like the Brilliance lamp, conducts market positioning studies by comparing their technology with other infant



Figure 4: The BRCK, developed by Ushahidi.

jaundice treatment technologies¹¹. This method of research is very understandable; to make a good technology, designers must know their competition, their context, and cultural nuances of the users in the location in which they intend to market. However, this practice also means researchers and practitioners develop disciplinary silos; human sanitation workers learn about sanitation problems and solutions, cookstove experts learn about cookstove problems and solutions, development practitioners which specialize in technologies in Kibera stay within Kibera, etc. This means, unfortunately, there is little chance in the larger space of international development for these designers to compare knowledge of their craft, effective methods, and precarious pitfalls across interventions and geographies.

Moreover, these new technologies have incited an interest to develop more innovative products like these, by replicating the spontaneous process of successful innovation. However, this brings up a critical problem for design research:

How can one extract the design process used solely from the finished product?

In theory, it is impossible. Most well designed products we interact with daily we acknowledge as innovative, but we have no idea how they are made, much less how they are were conceived. In practice, however, people still try to do so. People conduct studies which track the progression of certain product technologies across critical metrics of success; an example is Clayton Christensen's study of the hard drive industry across areal recording density and hard drive capacity¹³. Practitioners and researcher even develop case studies that aim to isolate the most important techniques they used to successfully develop, brand, and disseminate their product. For example, Kickstart's founder wrote a powerful piece that lists what works, and their personal design criteria, for developing the Kickstart Moneymaker, a treadle pump made for impoverished rural farmers. However, one important criticism will always exist; historical documents contain the pieces of data that the historian deems to be the most important. What might be important, however, might be what isn't documented: the omissions, those failures, the unknowns, the changed plans, which might be missing from the historical narrative.

In short, the point is this: to measure the process of design, one needs a process to analyze. To operationalize the innovation process, one has to use raw data about the process and interpret the data, apply it to design theories, understand the limitations of our methods, and work to improve upon the method's capabilities. Fortunately, we have a uniquely analyzable case of a design

platform – OpenIDEO – through which we can study the effectiveness of a class of design methods called human-centered design.

OpenIDEO.com is an online collaborative platform developed to crowd source design talent across the Internet to tackle difficult interdisciplinary problems. Think of it as Facebook for designers. Many of their design challenges have focused upon issues plaguing the world, including issues concerning impoverished communities. The platform uses tens of thousands of designers (at this paper's writing, 60,157 and rising) to contribute inspirations and ideas for product and service-based solutions. Highly influenced by its umbrella entity IDEO, the design consultancy firm, the website coerces the designers to thinking in the space of Human-Centered Design (HCD) to develop these interventions for the public and private sectors. IDEO has a pedigree of developing products and services that have considerable economic, social, and cultural benefits for firms and customers alike. They also aim to extend their knowledge into areas of social innovation: the IDEO community has developed a free HCD toolkit that helps designers develop products and services tailored for communities at the base of the pyramid.

Although the HCD techniques and mindset have been practiced and publicized by IDEO, they are not the only contributors to the HCD field. A collection of larger HCD literature argues for parallel, yet slightly different, metrics of conducting HCD, which rarely have a chance to be tested against real-world settings. Moreover, though IDEO venerates HCD and even aims to compulsorily take OpenIDEO users through the HCD process, whether they actually conduct design in this manner is no guarantee. Fortunately, the rich open content of OpenIDEO affords a novel opportunity to study the presence and effectiveness, in practice, of the very same HCD metrics IDEO holds dear. To do so, we synthesize seminal texts describing metrics for design thinking, and we develop a collection of metrics that use methods to identify and serve user needs. We then apply qualitative coding methods across multiple winning and non-winning design ideas, associated with four OpenIDEO challenges that address specific concerns of impoverished end users. Using this comparative case study, we aim to find the presence, or absence of certain design themes in the activities and processes of the OpenIDEO design community. We also use the pool of winning concepts, and a randomized sample of equivalently numbers non-winning concepts, to find if there is a significant difference across any of our design metrics.

To sum up, the contribution of this paper is to answer these following questions:

- 1) How can HCD theory help to supplement the needs of the current field of BOP theory, which aims to design products and services for the poor?
- 2) How well do the present themes and metrics of the OpenIDEO design community correlate with metrics of Human-Centered Design?
- 3) Can HCD characteristics be a potential predictor for successful designs?

By conducting a literature review of BOP based research, and by presenting a comparative case study that measures the HCD competence of design concepts in OpenIDEO, we aim to supplement the field of design thinking for poor communities.

Literature Review: Design for the Poor

The start and influence of BOP Market Research

Before we aim to express what design thinking can do for businesses that want to serve poor markets, we must build the research for the main drivers of interests in poor markets today. Though global initiatives that aim to help the poor through international development started in the late 1940's made famous by Harry Truman's inaugural address¹⁴, it was not until the early 2000s when Coimbatore Krishnarao (C.K.) Prahalad made the case that business should be the driving influence. A University of Michigan business school professor, Prahalad partnered with Cornell professor Stuart Hart to pen the working paper, "The Fortune at the Bottom of the Pyramid"¹⁵, and with Allen Hammond on the paper, "Serve the World's poor Profitably"¹⁶. With a plethora of collected research on the topic, he ventured to write a book "Fortune at the Bottom of the Pyramid"¹⁷ with Prahalad as the sole author. In the book, he argues that prosperity can only be addressed through the direct and sustained involvement of multinational corporations (MNCs). By the power of our own socialization, the global community came to the conclusion that issues of poverty should not be addressed using market-based solutions. For example, MNCs argue their cost structures are given, that the poor have no use for their products, and the poor have no need for intellectual and product-based innovation and sustained growth. Further, charitable organizations believe the profit mandate of corporations makes the entities untrustworthy for serving the already vulnerable poor.

Prahalad argues, however, that corporations can make a profit, by acknowledging individuals who live at the Bottom of the Pyramid as individuals and consumers. The process of co-creation assumes consumers are equally important actors in the problem-solving as the expats who aim to serve them. He argues *against* the overall ideal that the private sector cannot, and should not, try to make money from the poor; to do so, each product or service developed must be made affordable to the poor, geographically accessible, and available when the poor need it. In short, the businesses must make affordable, available, and accessible services (in the spirit of alliteration, other papers include other guidelines, such as acceptability and awareness¹⁸) Moreover, he aims to make a set of more specific guidelines for serving the poor:

- 1) Price performance: Quantum jumps in the price performance are required.

- 2) Hybrid Solutions: Advanced and emerging technologies that are creatively blended with existing and rapidly evolving infrastructure.
- 3) Scalable, transportable across countries, cultures and languages: Ease of adoption in similar BOP markets is a key consideration for gaining scale.
- 4) Focus on conserving resources: Eliminate, reduce and recycle resources.
- 5) Product development must start from a deep understanding of functionality not just form.
- 6) Process innovations are as important as product innovations.
- 7) De-skilling work is critical. Products and services must take into account skill levels, poor infrastructure, and difficulty of access for service in remote areas.
- 8) Education of customers on product usage is key.
- 9) Products must work in hostile environments.
- 10) Research on interfaces is critical given the nature of consumer population.
- 11) Innovations must reach the poor – designing methods for accessing the poor at low cost is critical.
- 12) Product developers must focus on the broad architecture of the system – the platform – so that new features can be easily incorporated.

Through the rest of the text, Prahalad forms the case for developing an ecosystem of business capability, by including specific market opportunities, creating private sector ecosystems with non-governmental organizations, small and medium entrepreneurs, cooperatives, local firms, and by reducing corruption that exists in these markets. He also discusses successful innovations developed at the BOP, including famous examples such as the relationship between Casas Bahia and CEMEX, the Jaipur Foot program, and the Aravind Eye Care system.

Though Prahalad furthered the thought that business can address poverty, we must clarify that the influence of MNCs in the global sphere isn't a new idea. In a seminal 1973 UN report on the impact of MNCs on the global sphere, they expressed their impact in depth: for example, the U.S. accounted for 1/3 of MNC profit, and the U.S. represented half of foreign direct investment in developing countries. The report cites the “manifested resourcefulness and flexibility of [MNCs] in the face of changing internal and external forces underlines their boundless capacity for adaptation”. Their unparalleled financial, physical, and human resource advantages means no national jurisdiction, South, North or otherwise, “can cope adequately with the global phenomenon of the [MNC]...” and they asserted that “the effect of technological advances on

the international market, given the existing concentration of products and know how in the hands of MNCs, has become one of the main causes of monopoly or oligopoly control¹⁹.

In today's global political economic ecosystem, not much has changed. However, one of Prahalad's main points, and of others whom believe in BOP-based business ventures, is that this massive influence should be leveraged on the world stage. Founder of multiple social business ventures for the poor Paul Polak argues the main reasons why businesses should be the main entities in lifting the poor out of poverty are because profitable businesses attract substantial capital, they can hire people, it is the entity on the global sphere which is most capable of reaching scale, the business entities marshal specialized expertise in design, financial management, and administration, they are less susceptible to political pressure than governmental and citizen organizations, and prosperous enterprises stimulate economic growth within the communities which they do business²⁰. In short, if directed effectively, it is due to their "manifested resourcefulness and flexibility" that can move the poor out of poverty – if business goes about it correctly.

His work was very influential and attracted both affirmers and critics. One of the most famous critics, Aneel Karnani also at the Ross Business school, penned several papers casting grand plan of business for the BOP as "at best a harmless illusion and potentially a dangerous delusion."²¹ He contests Prahalad's estimate of the poor's market size is an order of magnitude too large, the people are too geographically dispersed and culturally located to develop a grand plan to serve all of them, and critiques many of Prahalad's case studies for their actual impact upon assisting the poor. He explains the focus on interventions which do not raise the income of the poor, or help the poor make decisions in their own self-interests, are inherently exploitative. For example, he describes the harmful social effects of the alcohol and whitening cream markets in poor communities. He also argues that focusing on the poor as entrepreneurs and value-conscious customers results in little focus on the protection of the poor through legal, regulatory and social mechanisms, underemphasizes in modern enterprises that provide employment opportunities, and underemphasizes the role of the state²². He also states the main idea that 'doing well by doing good', which motivates businesses into the marketing to the poor by instilling a philosophy of corporate social responsibility is a fundamentally wrong proposition²³.

Regardless of the robustness of Prahalad’s central argument or of his critics, one thing that can be agreed upon is the book has inspired a wildfire of interest. It has given many large organizations the philosophical gumption that doing good (helping the poor in ways, and on scales, never thought possible) and making good (develop a market to the historically unmarketable) are not mutually exclusive. Months after the publication of the book, the World Resources Institute held a conference that had 60 CEOs and top executives around the world, and it was attended by 1,000 people from 60+ countries²⁴. The World Resources Institute estimated the total size of the BOP market

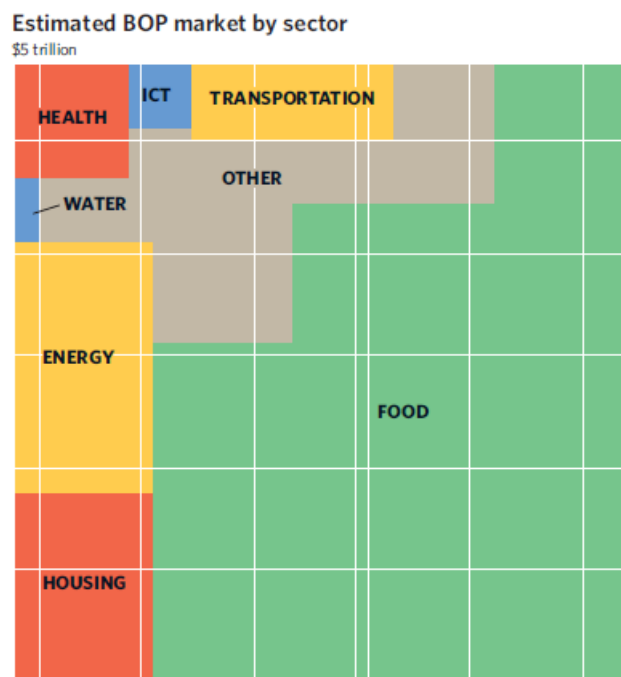


Figure 5: A portrait of BOP market by sector. The total area amounts to \$5 trillion. Source: The Next 4 Billion²⁵.

is \$5 trillion, while analyzing and measuring the size of its summative parts and using case studies, surveys, and available household expenditure data. A summative graph of the size of each main market is shown in Figure 3. Additionally, many large institutions are currently harnessing resources to tap into ‘emerging markets.’ Both Microsoft and Intel have created prolific divisions for researching and producing information and communication technology needs of the poor. In the water purification industry, large companies are becoming involved as well; Hindustan Unilever, subsidiary of Unilever, has developed PureIt, which delivers six liters of purified water for a rupee, and the high-tech manufacturer KX industries has developed the KX World Filter, which claims to bring water free of viral and bacterial loads, chemicals, and dirt for less than US\$0.03 a family²⁵.

The work in BOP hasn’t just sparked interest in business; research concerning BOP work has erupted as well. One of the systematic reviews listed here collected articles relating to the “Base of the Pyramid” or the “Bottom of the Pyramid”, they came up with 104 peer-reviewed journal articles specifically concerned with the concept. At the time of this writing, an unfiltered search in Google Scholar for ‘bottom of the pyramid’ or ‘base of the pyramid’ from 2004 to 2013 reveals approximately 17,200 results. Many people have advanced the research in the field, and

doing a systematic review of all the research is outside the scope of this work. Fortunately, multiple researchers have aimed to do so, and their work is included in subsequent sections to understand the current space of BOP research.

Needless to say, the work caused an explosion of research, investment, and overall interest in serving the BOP. But in the fast-moving world of business and development practice, however, the work is relatively old. One can ask, what is the space of BOP research today? We answer that question in the next section.

BOP Market Research Today

The influence of BOP-based research on the global scene, both in practice, and research is not debated. Its effectiveness as a field, and what direction BOP interested actors should pursue, however, is a hot topic of discussion. Various researchers have developed comprehensive studies of various kinds to understand the state of the field: what it purports to accomplish in theory, what it actually has done in practice, its true impact, its many limitations, and the future of the field. This section aims to synthesize central findings of these various comprehensive studies.

One study²⁶, published in 2012 as stated before, developed a systematic review of 104 peer-reviewed journal articles on the BOP topic. Though there are many articles that are left out of this study which are very valid, only because they might not use the exact terms “Base/Bottom of the Pyramid”, this serves as an important proxy of thought in the field. The articles focused on the key claim that poverty can be alleviated through financially profitable activity, but found widely disparate findings: there are imprecise definitions of who is actually in poverty; by segmenting the people who are actually impoverished, one can find how large the markets for the poor actually is. The lack of precision fuels criticism, as he argues most BOP initiatives don’t actually target people truly at the BOP. However, defining an exact definition might not only be difficult, but counterproductive, “in many the same ways that a poverty line in the United States leaves out those who are just barely poor.” The article suggests that researchers and practitioners define exactly who the intended market is, so economic and social context can be developed. Also, many BOP initiatives in the papers were led by small, rather than large, and local, rather than MNCs. Also, not all BOP initiatives were led by for-profit firms. The article calls for a better understanding of the different roles of big and small MNCs, big and small domestic businesses, social entrepreneurs, and non-profit orgs can play in BOP.

The article also discusses BOP business models and finds disturbing evidence; though one of the initial qualifications of BOP market initiatives is the focus upon engaging the poor as more than just recipient of development programs, the majority of articles regard the poor as consumers and nothing more. Moreover, the position of the poor in many projects is minimal: the initiatives usually require developing countries to supply little or no specialized skills, low barriers to entry, and limited or no scalability. Measurement of the community is also an important issue: though direct assessment is difficult, only 34 attempt measurement and 25 report some type of favorable

economic outcomes due to the intervention, while 28 provided measured results and 20 articles reported positive social impact of their intervention. Overall, though the article finds evolution has occurred in the field, the article calls for overall context and specificity: for instance, researchers must understand the place of different actors and business models in each intervention. The article also calls for interdisciplinary collaboration in BOP, as they found ways that development economics, business/management research, microfinance, and socially inclusive business can be included into the BOP market conversation.

Another article, also published in 2012, aims to also answer how BOP research has evolved through ‘first’ and ‘second’ generation understandings by using 40 widely cited, influential sources on the BOP obtained through various search engines²⁷. They found the articles focused upon advice and strategy and marketing for companies that want to enter the BOP, evaluation and critique of BOP values and initiatives, reports on cases of BOP initiatives, and description of BOP characteristics. The community suggests, for future ventures, that BOP ventures and researchers must understand the context of their intervention before they enter. Acknowledging the “multiple levels of economic, social, political, educational, skill, ability and knowledge potentiality, capacity or deprivation,” is required for success. Moreover, the most impoverished, those who live on \$1 a day, are not a source of near-term profit for business. Collaboration by multiple actors is also suggested in this work: though MNCs might have global capital, power, and connections, NGOs, government, and local businesses have experience, connections and understanding of BOP contexts, needs and possibilities that outside MNCs do not. Success requires nontraditional partnerships of many types. The article also reiterated that products and services must be customized for significant cost reduction, the impoverished communities must be regarded as designers, entrepreneurs, partners, and more than just consumers, and that the goods and services marketed must actively create ‘shared value’, or in other words, must improve the lives of the BOP consumers to make significant impact. The article also notices fact that there are few longitudinal studies about the BOP’s impact, there is little examination of BOP-based work from the indigenous community’s perspectives, and differences in approaches between for-profit and non-profit main institutions.

Another paper still aims to “Revisit the fortune at the base of the pyramid” by suggesting two new theoretical bases through which to serve the BOP by using another literature review as data²⁸. The first two views identified in the paper proxy the current methods of BOP-interested

businesses, which include finding fortune at the BOP by selling goods and services; and creating fortune at the BOP by building connections with nontraditional actors. The second views are sharing fortune with the BOP using social responsibility theory; and enabling fortune at the BOP using critical social theory. They suggest the conventional approaches (the first two views) undermining the dignity of BOP communities, discrediting their unique knowledge systems and potential contributions, and fails to readily acknowledge both the impact BOP-fueled business ventures have on the communities and the capabilities BOP communities can bring to assist such ventures. By drawing upon social responsibility theory for BOP 3.0, the article suggests “it is in the enlightened self-interest of MNCs to share a part of their profits with the underprivileged communities” because of the inequitable strength, power, and knowledge networks of MNCs and the negative social and environmental externalities of traditional global value chains that exist. Social responsibility theory suggests that sharing profits is a way to decrease volatility of global markets, mitigate risks related to crime and terrorism, enhance income and employment creation in BOP clusters, and to enable creation of new types of jobs in the developed world. The other view, influenced by critical social theory, aims to enable fortune with the BOP. The authors acknowledge “BOP’s traditional and indigenous technological base is generally locally efficient and relies upon local complementary resources”, and learning to leverage those resources to enable fortune for the BOP can enable dramatic reductions in poverty. It is important, however, that while MNCs source local knowledge from the communities, the communities retain their commensurate share of credit and value from said venture. However, the paper does note that there is a need for comparative empirical studies that focus upon the costs and benefits, and sustainability of, the views of the paper.

Other comprehensive articles aim to supplement the literature concerning products and services for the BOP, but choose to adopt different epistemological groundings. For example, one article harnessed existing ‘subsistence market’ literature, similar to research on those living at the BOP, and analyzed them across parallel but differing theories involving people who live at the bottom of the pyramid. One influential theory is the one of product adoption developed by Everett Rogers, which suggests that products are embraced by a community due to a set of qualities which fall into categories of consumer characteristics, new product attributes, social context, and the developed and present marketing environment. The second is the theory of poverty advance by Nobel Prize winning economist Amartya Sen, which argues for the multidimensionality of

poverty caused chiefly by the inability of the poor to acquiring freedoms in capability and opportunity. Though the theory background is different, certain findings are peculiarly similar; by suggesting various variables in the social contexts, marketing environment, and product attributes, the article strongly suggests that the members actively aim to understand the context surrounding the society, the market, and the product, which means developing a ‘deep knowledge for the destitute and their surroundings²⁹.’

However, not all the review articles only review the literature; in many instances, researchers analyze those who try to put these methods to practice. Under the lens of creating mutual value for the business and the community, one article harnesses sixty-four successful ventures into BOP markets to identify and categorize the constraints producers face while serving the poor³⁰. They then use a comparative case study to find out how eleven successful ventures address said constraints, to create value for both the local producers and the ventures themselves. They found two large categories of constraints, further divided into six separate categories: productivity constraints with sub categories of financial resources like investment capital and affordable credit, the lack of raw material resources, and lack of production processes like expertise and technology. The other category is transactional constraints, with subcategories of businesses lacking access to markets, minimal market capabilities, and insecure market security, exemplified by lack of sale reliability and the impact of price fluctuations. Various methods were used to address the many issues, including orchestrating novel financing agreements to solidify their prices, developing training and raw materials resources, and by making investments in improving market access, including many others. One important point, however, was that the individual cases needed to be knowledgeable about the constraints in their business, and flexible in how they decided to address them.

A 2008 paper by the United Nations Development Programme also uses the case study method to distill BOP issues into five separate constraints on aspirational businesses: market information, regulatory environment, physical infrastructure, lack of knowledge and skills, and lack of access to financial services. They also suggest certain strategies in solving these issues: adopting products and processes, investing in removing market constraints, leveraging the strengths of the poor, combining resources and capabilities with others, and engaging in policy dialogue with the government. The UNDP case then collects fifty case studies and sees how each case study sees if there is interaction between the constraints and the strategies in each study.

Among the many suggestions for the actors in this field, the study suggests business should create capacity for space and innovation inside the organization, adapt their products and services and deepen community engagement to be successful³¹.

We find, through these comprehensive papers, the parties interested in serving the BOP have matured greatly. There is an understanding that many of the previous prescriptions were too general and exclusive, and the descriptions of the communities were too broad. The businesses who aim to develop work by and for the impoverished communities have an economic interest and a social imperative to better understand the communities in which they aim to become involved, to focus their purview, and to develop ways that the communities will be involved and accrue value as well. The businesses must better understand that though they were dubbed the main driver of poverty alleviation by Prahalad, working without inclusion of other entities with other knowledge capabilities will eventually cause failed ventures. Considering the entire impact of your intervention – both downstream with distributors and marketers close to the users, and knowledge entities such as NGOs, state entities, is imperative. Moreover, there is a large call for actively measuring the impact of these ventures: whether through economic or social means, whether through empirical studies, whether through longitudinal or single-time methods, through geographical comparison or otherwise. In short, entities interested in developing products and services for the BOP must do three things well while they design their intervention: include other stakeholders, develop innovative and flexible solutions to these problems, in measure the impact of their contribution.

Design Thinking in International Development

Before we focus upon HCD research for the poor, we must make one important point clear. This paper does not mean to suggest that design in the space of international development is not already a rich field of discovery; there is an exceptional amount of work, albeit decentralized, being developed across the world. However, the space of knowledge is very decentralized, and seemingly without focus. However, there are certain realities about the field that can be extracted. Doing a systematic literature review of all the types of design thinking research for international development would be outside the scope of the research. However, we would be remiss not to note pertinent examples of pro-poor design thinking research.

Before we focus on design thinking for the poor, we must first define ‘design thinking’. Tim Brown, CEO and president of IDEO, defines the discipline as one that “uses the designer's sensibility and methods to match people's needs with what is technologically feasible and what a viable business strategy can convert into customer value and market opportunity.” Instead of attaching designers to an idea further downstream, when the product or service requires only “a beautiful wrapper”, design thinking strategically imbues designers with the power to creatively address customer needs throughout the life cycle of the product’s development. Such products are in no way simply physical; they can be services, ICT interactions, ways of communicating and collaborating, experiences, policy interventions, and many more³². One must understand that main points of design thinking are to enhance creativity, understand the community, and to think holistically.

One article acknowledges that this burgeoning field of “Design for Development” (DfD) has grown in haphazard ways, but aims to direct the conversation by asking three critical questions: (1) what are the goals of design for development, (2) how can the impacts of design for development be sustained, and (3) is remote design, where the designers are separated from the user community, appropriate for the task³³? The article acknowledges that focusing on the end product in a complex and largely unknown design environment to designers is too narrow a view. Indeed, though user-centered design is not a new concept to fields like human-computer interaction, failing to understand the needs of the end users continues to be a theme of DfD failures. To truly make the interventions impactful, as Paul Polak states, one “shouldn’t even bother [designing]’ if they have not engaged in ‘good conversations, with [their] eyes open, with at least 25 [potential users]’”²⁰. It requires the understanding that the designers must consider the production, distribution and the repair of the product, the capabilities of the communities which will house the design, and how parts of the design process can help or hinder the product. (i.e., if prototype iteration before revenue is generated is an economic feasibility in impoverished places, etc.). Moreover, remote design has become a powerful trend for new designers (with OpenIDEO being a critical example). In traditional design, however, the reality is the people who design technological solutions are unlikely to be the users of the technology.³⁴ The article, understanding the ineffectiveness of true remote design but understanding its place and influence in industrialized communities, decides to shift the question, to what would improve the effectiveness of remote design-for development projects. They answer said question by stressing

individuals who recognize the limitations of the remote design process, the development of strong partners, comprehension of stakeholder needs and capacity building in the community, and a public and transparent conversation about the failures and the lessons learned with design projects.

Another important field of design heavily involved with serving impoverished communities is participatory design. First developed for Scandinavian factory workers in the 1970s, the field was developed so that the users of a necessary end product would be holistically involved in the design process. The many aspects of the field has been connected to fields: economics, where it is argued that participatory design minimizes the information asymmetry in the development process and will eventually diminish the ex-post transaction costs of the system's integration and evaluation³⁵, ethnography, where they try to use ethnographic methods to remedy the issues of 'a right solution to a wrong problem' during the user-designer collaboration process which hinders effective solutions³⁶, and human-computer interaction, where researchers express the creation of a 'third space' – which is not the domain of the user, nor the technology developer, but one which inhabits attributes of both³⁷. The method is used in many development contexts, including language learning games with rural schoolchildren, and in tracking the development of e-governance initiatives under the lens of shifting power dynamics during the design process³⁸. One paper of notes focuses upon why large product development organizations, like MNCs, face obstacles in instilling participatory design, including difficulties for companies to find true end-users to design with, how to obtain access to ones who can effectively design with the product developers, and in obtaining user feedback, among others³⁹. Although the participatory design philosophy doesn't currently fit in many large organizations due to various institutional obstacles, the article does argue that the large resource base of the organization could serve to shift the company's view: if it deems the cultural shift a priority.

There are also researchers who have studied the nexus of design and poverty by surveying specific cases of design for the BOP. One of particular note understands that the MNCs have failed to acknowledge the end users as little more than consumers; as a result, they address the issue by analyzing how impoverished entrepreneurs would like their products developed⁴⁰. Under this lens, if large companies change their view of users as micro-enterprisers, the relationship becomes one between two businesses instead of one between a business and a consumer. This means the focus of the connection becomes sustaining the relationship over long

times, rather than the momentary of any single product the larger entity has developed. Though the author acknowledges many products of need are excluded from this design classification, and the low amount of reviewed cases means the findings likely exhibit self-selection bias, the contribution of a new type of relationship between community and expatriate businesses is worth further exploration.

Another example of researchers who conduct design for development are researchers at HP India Labs, who underwent a study of the capabilities of contextual design by innovating for novel ways to introduce imaging and printing opportunities to Indian households⁴¹. They called their design method ‘contextual design,’ where they aim to combine methods of design exploration to understand user needs and to combine with business objectives. Though the researchers state their main purpose was to collect ethnographic data to generate new technology and business ideas in an interdisciplinary team, the focus of the paper was on the data collection. For their particular project, they focused their market by finding communities with a sufficiently supportive media infrastructure, by focusing on communities with a relative amount of disposable income. Moreover, the research presented a case study in the methods and importance of ethnographic research, instead of the actual development of ideas or a tangible prototype.

Another article aims to shift the paradigm in how holistic design is conducted, by harnessing design research literature in multiple fields. It aims to reach conclusions about how effective holistic design requires consideration of all these fields at once, instead of any single methodology in isolation⁴². Certain design problems have many interrelated facets (i.e. product creation, scaling, distribution, repair, recycling, etc.) and multiple design ‘virtues’ (i.e. inclusivity, sustainability, cost, quality, etc.). Though designers have traditionally acknowledged the presence of these many virtues and life phases, most ‘design for X’ literature (X being any one of these individual aspects) has been inherently reductionist; only one of the problems, or a few, are picked to address. This exclusionary method of development fails to acknowledge the aspects which were excluded from the process. Moreover, attempts to objectively generalize the process of decision making through multi-attribute utility theory have come up short, i.e. there is no simple algorithm for defining what design decisions for every situation. With this knowledge, the designers must take as complete a view of a product’s physical and intentional natures as possible, take into account implicit preferences of the impacted stakeholders that are not

normally captured in traditional design processes, acknowledge that disparate ‘design for X’ techniques impact the whole of the process in different ways, that using one methodology in isolation of the others goes against the holistic engineering philosophy they are intended to support, and these separate virtues and phases must be reflected in every relevant design decision.

To reiterate, much of the design work for international development is very decentralized and diverse. Different fields address the design issues with various perspectives, interests, and findings. These researchers enter different stages and methodologies of research, all with the main goals of finding out which type of design method to adapt for effective product design. These design methods which are discussed separately in theory, do not have to be mutually exclusive in practice. Adopting the tenets of HCD does not mean designers have to drop other design theories, designers can learn more about, brainstorm better, and more quickly envelop the plausible ideas into the necessary community while using other design methods. But first, we must develop the theory as to why HCD methods aim to develop better solutions for the poor.

Human-Centered Design

(HCD is a design methodology that uses methods of deep understanding, brainstorming, and rapid creation-feedback mechanisms to create interventions that address problems of end users⁴³. It recognizes that people are creative and resourceful in their own contexts, and truly effective technological understanding means facilitating design in our everyday lives⁴⁴. The design firm IDEO, through their HCD Toolkit, compartmentalizes three phases for HCD: Hear, Create, and Deliver⁴⁵, while IDEO’s CEO uses the names: Inspiration, Ideation, and Implementation⁴⁶. The International Encyclopedia of Ergonomics and Human Factors splits user-centered Product Concept development into five sections which mirror the three mentioned in the toolkit: project commitment and user and technology research (the Hear phase), innovation sprint and concept creation, (the Create phase) and validation and project assessment (the Deliver phase), as shown in Figure 4⁴⁷. In the spirit of standardization, the rest of the paper will refer to the three phases using the terminology of IDEO’s HCD Toolkit: Hear, Create, and Deliver. The three phases are shown in Figure 5.

In the Hear phase, designers aim to understand the end users of a design as well as possible through two main activities: collecting the data about the users’ environment, and analyzing it to

obtain an understanding of the needs of the community. A complete explanation of the varied methods used to collect and analyze user data is outside the scope of this study, but Kuniavsky, M. provides a useful reference⁴⁸. Examples of design activities that take place during this phase are interviewing users, conducting observations of tasks the user performs, or doing primary or secondary research on the user's environment. All of these prompts aim to put the designer in the space of what storytelling researcher Nancy Duarte describes as the space of *what is*. The theory is simple: before one attempts to solve the problem, one must understand the context of the communities. The more data on the user, and the higher the user's involvement in the design process, the better.

The requirements of the BOP community for understanding the community can be satisfied by the Hear phase. The main point of design researchers is to understand all aspects of the community in which they live. As was stated before, though user-centered design is in no way a new concept, individuals who design for the poor continue to make assumptions about the communities' capabilities, available stakeholders, available resources, the ease of marketing, and many other fields. As was stated previously, failing to understand the needs of the end users continues to be a theme of Design-for-Development failures. Thus, designers must learn the

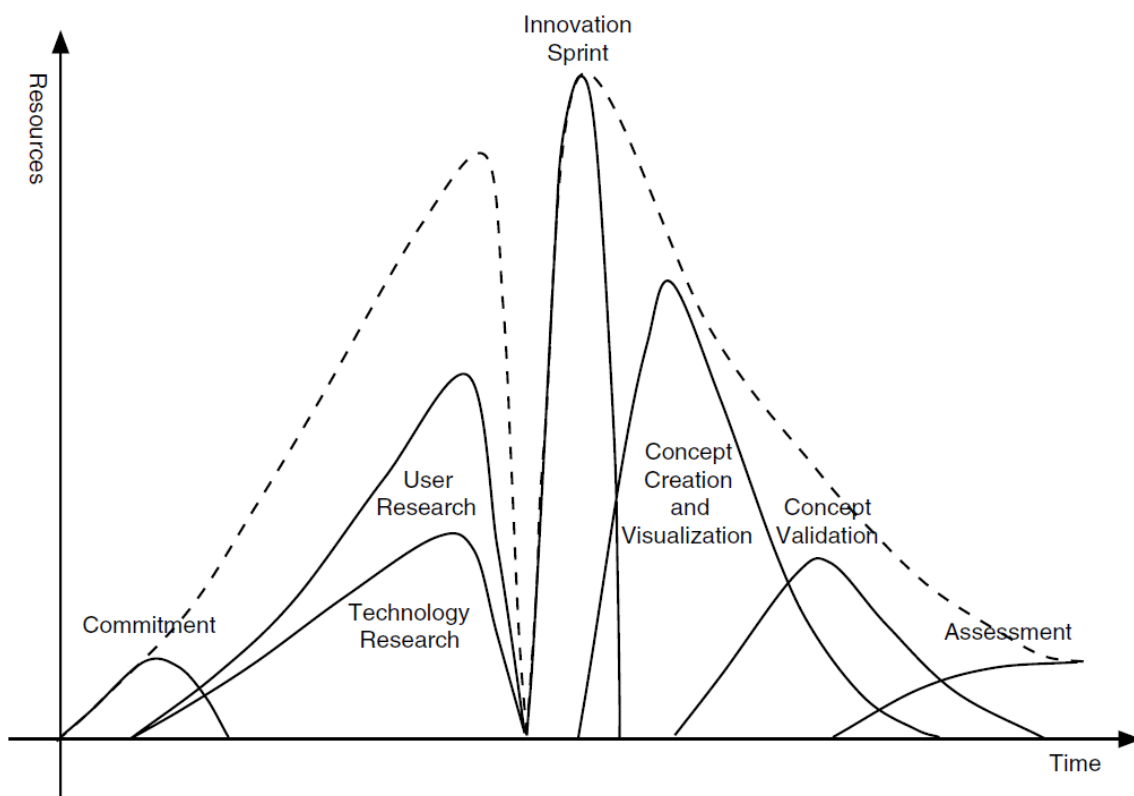


Figure 6: User-centered products development process. Source: International Encuclopedia of Ergonomics and Human Factors, Second Edition: Chapter 343.

community's needs, capabilities, and workarounds, and work to synthesize the realities of the community into resources, market positioning data, infrastructural capacity, and design opportunities.

After gathering information in the Create phase of the process, designers use methods to brainstorm many diverse solutions that address common needs of the user. For a full literature review of creation methods, we direct readers to following review papers for more information^{50 51 52 53 54}. To create ideas effectively, one must both expand and explore the design space⁵⁵. The Create phase, and its tenets of innovation and flexibility, can critically supplement the need for novelty in business strategies for emerging markets. However, the space of innovative thought for innovation does not only have to reside in the design process; it must be present during the many aspects of scaling and implementation. Examples of innovation past the product design phase include when Paul Polak decided to use a feature-length film with top Bangladeshi movie stars to advertise his treadle pump to the Bangladeshi community²⁰. Being open to nontraditional partnerships, different methods of adoption, and expert capacities of the community is critical for success.

In the Deliver phase, designers focus on maturing the solutions into tangible forms to assess which ideas will succeed, which will fail, and how the ideas should be amended. By rapidly developing new ideas, assessing the project by obtaining feedback, and iterating the feedback into new prototypes, designers improve their solutions quickly and effectively by leveraging user and community input⁵⁶. In general, HCD recommends multiple iterations of this process of feedback and prototype development. This phase buttresses the need for evaluation of products during design, and inclusion of the community. Though designers might think they know loads

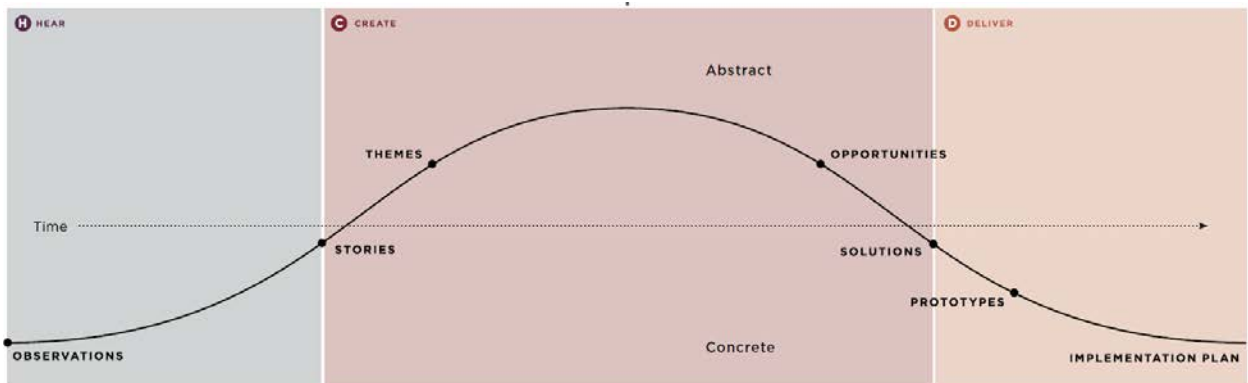


Figure 7: Chart of the HCD experience with time on the horizontal axis and thought space of concreteness and abstraction on the vertical axis. Source: IDEO's HCD Toolkit.

about a community once a minimally viable product has been developed, there are always ways to improve; those improvements, however, can only be revealed through user feedback. Acknowledging faults of their contribution early in the process is much less expensive than fixing issues later in the process. Moreover, including users and other stakeholders help to solidify the necessary relationships which are required to develop sustainable products around interventions.

Apart from the IDEO standard, another attempt to standardize the process for conducting HCD is in ISO 9241-210, aptly named “Human-Centered design for interactive systems”. The document suggests HCD improves solution quality in key ways: by increasing the user productivity and the operational efficiency of organizations, by making processes easier to understand and use, by increasing usability for people with a wider range of capabilities, by improving user experience, by reducing discomfort and stress, by providing a competitive advantage through improved brand image, and by contributing towards sustainability objectives. The ISO standard defines six principles for conducting HCD:

- The design is based upon an explicit understanding of users, tasks, and environments.
- Users are involved through design and development,
- The design is driven and refined by human-centered evaluation,
- The process is iterative,
- The design addresses the whole user experience, and
- The design team includes multidisciplinary skills and perspectives⁵⁷.

These principles serve to further compartmentalize the processes of knowing the user’s environment, and measuring the process.

Limitations of User-centered design concerning BOP research and practice

Though there are many aspects of product and service design for the poor that HCD can address, there are things it cannot. Moreover, there are certain limitations of the process of designing for the poor that the design community has had trouble addressing as a whole. This section focuses on the shortcomings of HCD, and BOP market research.

One critical problem of using HCD as an innovative process is the actual measurement of its impact. To explain, let us conduct a thought experiment of a rigorous impact evaluation, where

we develop a low-cost way to sanitize water in an impoverished community. One way to do so would be to develop a longitudinal study with three separate populations: in one of the communities, no treatment is instilled, in another one of the communities, a treatment developed through non-HCD methods is used, and in another community, a treatment developed through HCD methods is used. One could conduct a difference-in-difference test that compares the impact of the three communities across multiple critical variables in the community from economic, social, or an environmental nature. Also, we would assign different set of designers to each product, because if the designers were the same, they would invariably integrate design knowledge from one intervention in the development of the other. However, it is difficult to tease out which parts of the design process were actually impacted solely by the HCD methodology. The products, which are the true units of measurement, could be influenced by the designers who developed the product, the specific communities in which they aim to work, how well the design process was carried out, how receptive the communities were to the product, or many other variables which are nigh impossible to control.

Moreover, teasing out the true impact of a continuously iterative process of design, asks the question: at what point is it most effective to actually measure its impact? An important metric of effective designs rarely included in the process is sustainability across time. It is relatively difficult to find out when a design process has truly reached a stopping point, or in other words, a time in which the design's impact should be measured. Moreover, relying on longitudinal measurements might hamper the design process' capacity for creativity when the intervention has not yet been solidified.

Another issue has to do with the use of HCD techniques in practice. Let us take the example of the water sanitation interventions for the impoverished community. In an ideal study, we would not want the two treatments to be co-variated; for instance, we wouldn't want the design processes to influence each other, or we cannot actually tell whether one process is more effective than another. In practice, however, knowledge of the competition methods is a celebrated strategy of design. To define one's market position, designers are encouraged to find competitors and their current methods of product and service design and development to make a better product; this method falls under holistically 'knowing' the community for which you are designing. Moreover, an impact evaluation study would want the populations in practice to be as similar as possible; in business practice, the more alike the communities are, the more likely the

design processes will interact with each other. These issues of influence, both by the evaluative measures, by outside factors, and by other design processes, make comparative impact difficult to robustly assess.

Another limitation of the HCD process is the consideration of sustainability. In practice, the process of design develops a theoretical foundation for a product's creation, but not necessarily its sustained livelihood. The downstream implementation and impact analysis of such a product in practice is usually left to a different community, and such product handoff has not been done effectively through history. All of this is said to say; understanding the rigorous impact of HCD is, as of yet, uncharted territory.

Although this paper suggests various ways that HCD theories can buttress BOP based research, there is little research which aims to answer the converse question; how to effectively instill market-based design knowledge into HCD work. Although understanding the economic environment of the community is an integral part of the "Hear" phase, it is not necessarily the focus. However, designers must ensure that an end product or service is economically viable. This might mean the combination of HCD methods with certain business design methodologies, such as zero-based design, as outlined in Paul Polak's "Business Solution to Poverty", with product-service systems theory as outlined in publications by Jagtap and Larson, or various other alternatives^{20 58}.

However, there are certain issues that the larger field of product design for the poor has not addressed effectively. For instance, using the market to serve the poor cannot reach the poorest of the poor in the world. To be effective, one must target communities that can actually support even basic market mechanisms. Unfortunately, the 1 billion people who live below \$1 a day, other methods of assistance take precedence⁵⁹. Also, the entire conversation concerning the synthesis of BOP-based research for developing poor markets systematically excludes the issue of environmental impact. Though designers aim to develop localized solutions, an important goal of many products is growth, both in impact and in market share, in the same framework that our economic community has grown used to. However, growth in the model of industrialized countries is a sustainable impossibility. Multiple texts outline and illustrate these issues^{60 61 62}, but this simply illustrated example from *The Business Solution to Poverty* is quite effective: if everyone on the earth, adopted the middle class lifestyle of the United States, the planet could support a maximum of one to two billion people – a much smaller number than our current

population²⁰. Clearly, a different model is needed, and effective HCD design that accounts for environmental sustainability should be prioritized in future research and practice.

The Connection between HCD for BOP and OpenIDEO

Though HCD, and current BOP market research has its design limitations, we have shown there are critical ways that HCD methods can be used by businesses to serve the needs of the BOP market. We can do so by learning the realities in impoverished communities, their issues, and their capabilities; by ideating innovative solutions and ways to implement them, and by quickly prototyping solutions on the ground where designers can adapt solutions to the true needs of consumers. However, as of yet these claims are only buttressed by theory, and not practice. To do so effectively, as was explained in the introduction, the best way to analyze a design process is to have a process to analyze. Unfortunately, this is easier said than done. Many designers make their methods of product creation secret to the larger community to maintain a competitive advantage. Unfortunately, many of these products fail to serve the holistic needs of the community, and the proprietary nature of the methods keeps the failures away from well-meaning designers.

The truth is, many business entities do not have philosophies of HCD involved in their infrastructure. Traditional design processes are still used, where the designers are separated from their communities of interest. Moreover, these barriers of assumed knowledge, structural competition, and incremental technology change keeps businesses from acknowledging their structures need changing before true service can be adopted. According to the influential business strategy literature *The Innovator's Dilemma*, Clayton Christensen explains that it is due to large company's structural inability to change in the face of disruptive technological changes that causes their eventual failure¹³.

However, these issues aren't unsolvable; as was stated earlier in the chapter, large businesses and various disciplines are invested in serving the poor in novel ways, even if it means nontraditional design methods. However, as of yet, the discourse of this paper, have been based in theory. What can HCD do in practice? To do so, we conduct an extreme comparative case study, with OpenIDEO, a subsidiary of the design firm IDEO.

Though IDEO is not as large of an actor on the global stage as many other MNCs, their methods and impact has qualified them as disruptive in many different fields. They only employ 600+ employees, but they have used HCD methods to address issues in governmental policy, medical products, energy, health and education, the public sector, organizational design, and social innovation (their classification of international development-esque problems)⁶³. They have received multiple innovation awards from Fast Company, the Boston Consulting Group, and Fortune magazine, and have assisted notable clients including 3M, AT&T, the US Department of Health and Human Services, and the Bill and Melinda Gates Foundation. OpenIDEO serves as a social experiment in crowd-based social innovation; by making anyone who logs in a designer, the platform suggests ideas IDEO could not consider. Through this extreme case of HCD, the larger community of business interested in intervention marketing for the poor can learn the opportunity HCD can serve as a new way forward for serving those communities who need it the most.

OpenIDEO was chosen for two main reasons: its extreme focus on HCD as a method for product and service development, the fact that certain design challenges were made to address issues of impoverished communities, and the fact that all the design content remains open-access for researchers and designers to see. By understanding the capabilities and methods of OpenIDEO, one can understand how HCD can better influence the innovation process. One of the most acute criticisms of the platform is that it is a prime example of remote designing. Theoretically, however if impoverished communities have an internet connection, they would be able to contribute, but even reliable internet is no guarantee or the want of users to contribute to OpenIDEO, or that their contributions would make an eventual impact. Fortunately, by using HCD as a lens, we can find out if worries about remote designing are worth the mention.

The methods in OpenIDEO, however, are not easily relatable to other MNC's mission, methods, or organizational structure. Few MNCs would elicit ideas from tens of thousands of potential designers, using an open innovation, open-source website, with issues of widely varying disciplines sponsored by entities of widely varying interests. A design method more connected to the direction of the literature review would be to develop a case study of a more traditional large MNC, with an interest in serving emerging markets in their field, while aiming to use HCD methods for the first time. In this hypothetical study, one can see how the business operated before such a venture was considered, how the corporation uses methods of HCD in practice, and

how both the community and the business were impacted by the process. However, we can still learn much from IDEO's extreme case, such as what HCD can do if utilized in a zealous fashion.

Comparative Analysis of OpenIDEO

OpenIDEO

Over the past three years, IDEO, an internationally renowned design firm specializing in HCD, has operated an online community platform called OpenIDEO designed to combine the empathic strengths of HCD with the geographic reach of ICTD technologies. Influential organizations like Water and Sanitation for the Urban Poor, Oxfam, and the Grameen Creative Lab, among many others, sponsor design Challenges that designers can address online together. In theory, OpenIDEO members with on-the-ground access to end users can connect with other members from around the globe, providing the end-user fluency necessary to perform good development design with the breadth of resources associated with ICTD.

OpenIDEO is an online Open Innovation platform in which volunteers from around the world post relevant information in response to design “Challenges”. The challenges used for analysis, chosen because of their focus upon issues plaguing impoverished communities, are as follows:

- How might we increase the availability of affordable learning tools & services for students in the developing world?”
- How can we improve sanitation and better manage human waste in low-income urban communities?
- How might we improve maternal health with mobile technologies for low-income countries?
- How might we use social business to improve health in low-income communities?

OpenIDEO differs from a standard Question and Answer type forum in several key ways: the process of developing solutions is split into several key stages (mirroring the Hear, Create, Deliver process described above), and the process of submitting a solution encourages iteration and building off of prior submissions. Both of these differences become critically important later in our analysis, since they provide clear markers for the presence of certain HCD behaviors.

IDEA BACK TO LIST ◀ 76 OF 176 ▶

Exchange: Minutes for service a)

Community members can exchange talk time on their phone bills for time helping out pregnant women.

Exchange: Minutes for service

This is how it works for members of these low-income communities:

You can either rent a phone from a kiosk (in a communal space) or use one you already have. For the amount of time you talk you can either pay the bill or donate in kind your time and skills to help out pregnant women. There are many different ways you can help. You can share your own personal experiences with pregnancy (child birthing, nutrition, exercise, etc.). You can use resources at your disposal (car

Submitted by: b)
 [Redacted] March 12, 2011, 01:07AM

637 views
 4 comments
 5 applause

Applaud this

+ Build on this

BUILT UPON THIS c)

Figure 8: A submission on OpenIDEO consists of several elements: a) the main description of the Concept, which includes text, images, possibly videos, and comments from other members of the site; b) information identifying the user who submitted the Concept; and c) links to which previous submissions this Concept used as inspiration.

OpenIDEO uses indicative systems of framing to involve the user in a certain space of thought. For instance, during the "Inspiration" or "Research" phase, the designer is encouraged to “share existing stories, tools, case studies, and examples.” An example contribution is shown in Figure 6. These inspirations serve to gain a collective understanding around the challenge topic, and to inspire new solutions. The more visual, the better.

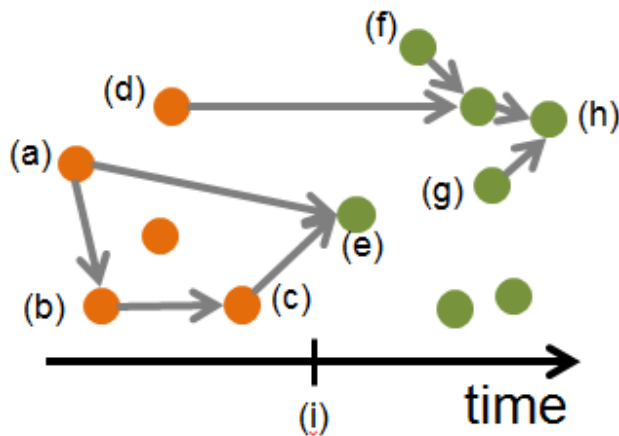


Figure 9: An example network of OpenIDEO with inspirations (a), (b), (c), and (d), and concepts (e), (f), (g), and (h). The arrow's direction indicates if it served as a foundation for a separate idea; for instance, (h) cited idea (g), thus (g) is a foundation for (h). For these Challenges, OpenIDEO's switches from the Inspiration phase to the Concepting phase (i), at which point the type of inputs designers can submit changes.

In this phase, the designers of OpenIDEO are incited to think about what the end community is actually like. They might be compelled to think about the culture, the economic situation, the educational level, the stakeholders on the ground. They might be compelled to find out information from people who

live on the ground, or compelled to find info from people who have experience doing so. They also might think about the state of the global value chain, and its impacts on the ecological

environment. OpenIDEO then changes the frame in the “Concepting phase.” As listed on their website, OpenIDEO asks designers questions such as, “How would you solve this problem?” and suggests the designers consider “...areas of opportunity where new ideas might flourish – to spark our creative efforts.” In this phase, designers are coerced to shift from a mindset of documentation, to creation; from the reality of the present to the capabilities of the future. By breaking the mindset of acknowledging what exists, the community members have a chance to create radical answers to the design Challenges. It is indicative of the famous Einstein quote: “We can’t solve problems by using the same kind of thinking we used when we created them.” This method serves to shift said thinking.

While this happens, the designers are encouraged to interact with other Concepts by referencing them in their design. Thus, many Inspirations build off of other Inspirations, and Concepts build off of other Concepts and Inspirations. An example of a reference map that can develop due to these relationships is shown in Figure 7. Because designer contributions can be modified until the end of a design phase, designers can see contributions that happened before or after their own, and use them as reference.

To involve the designers more, then, the website uses methods of turning aspects of the website into a game, or “gamification”, to get the users to interact and collaborate. Examples include the Design Quotient, shown in Figure 8, which appears on designer’s profiles and gives the designers a snapshot of their interaction on the website. The website turns the interaction on the website into four categories: research, ideas, evaluation, and collaboration; the more you interact, the higher your Design Quotient score. Another example is the “Applause” function where designers have the opportunity to give a certain community idea their

MY DESIGN QUOTIENT



RESEARCH	2,540pt
IDEA	3,332pt
EVALUATION	549pt
COLLABORATION	3,498pt
TOTAL	9,919pt

Figure 10: Design Quotient.

recognition in a quantified manner, akin to a ‘like’ on Facebook or a ‘favorite tweet’ on Twitter. By doing this, the contributions in each challenge can be ordered by those with the largest amount of applause, or other methods like the largest amount of views. Also, designers have the opportunity to comment on other designers or on the Facebook page. In many instances the comments are used on the design to suggest changes, applaud ideas, to present questions; they are used to interact in many ways with the product. The website also sends periodic emails if comments are left on your profile or a particular design, to give designers knowledge about activity on OpenIDEO, and another manner of deciding if interaction is necessary. Though OpenIDEO gives designers the opportunity to interact with the community and potentially develop a design that could develop into a real concept by verified sponsors, the website does not give out compensation for the designer’s focus; in this way, the designers volunteer their time and design expertise to address these Challenges. After the design cycles are closed, the designers can evaluate the ideas across multiple qualitative metrics, such as the idea’s perceived capacity for growth, how innovative it is, and does it address the suggested problem. After that process, the sponsors then chose around nine to ten concepts they would like to support by selecting them as “winning” concepts.

Throughout this process, all user interactions are collected and displayed online and it provides a rich snapshot of the design process for each Challenge. Using this record, we analyze the presence of HCD thinking throughout the OpenIDEO design process. For further description of

OpenIDEO's process as well as quantitative analysis of the community and its evolution over time, we direct you to interested prior research on OpenIDEO^{64 65 66}.

Methods

For this study, we apply a combination of the ISO9241-210 metrics expressed above and the HCD toolkit developed by IDEO, to several concrete examples from OpenIDEO, to demonstrate how to isolate measurable HCD metrics within an online design process.

To determine the prevalence of HCD techniques within OpenIDEO, this paper conducts a hybrid qualitative and statistical analysis that has several parts. First, we define what Challenges and concepts we analyzed and how design success was measured—this sets our sample and independent variables. Second, we discuss how to measure HCD attributes in a given Concept—this sets our dependent variables.

Challenges and Concepts

At the time of writing, OpenIDEO has 24 active or completed Challenges on their website. Of these, only a subset dealt with Challenges specific to design for development projects. To reiterate, we selected four of these Challenges for further analysis that focused upon basic needs issues in poverty-stricken communities:

- How might we increase the availability of affordable learning tools & services for students in the developing world?
- How can we improve sanitation and better manage human waste in low-income urban communities?
- How might we improve maternal health with mobile technologies for low-income countries?
- How might we use social business to improve health in low-income communities?

For ease of reference, the Challenges henceforth shall be referred to as 'Affordable Learning', 'Human Sanitation', 'Maternal Health', and 'Social Business'. In total, 76 concepts were analyzed: the 38 "winners" from across the challenges and 38 randomly selected non-winning concepts from the rest of the Concept pool. Nine winners and non-winners were obtained from the 'Affordable Learning' and 'Human Sanitation' challenges, and ten winners and non-winners

were obtained from the ‘Maternal Health’ and the ‘Social Business’ Challenges. The amount of Inspirations, Concepts, and Winners from each challenge is listed in Table 1.

The “winning” Concepts for each Challenge are the primary measure of design success throughout the paper. We then compare winning concepts alongside, and against, an equal number of randomly selected concepts from the non-winning submissions. These non-winning Concepts are not statistically representative of the total list of non-winners, they just serve as a point of comparison between the winners and an opportunity to see the variety of Concepts suggested for each Challenge. If the metric in consideration is categorical, and the Concept sufficiently satisfies by the metric, the value is recorded as such; if the metric is numeric, the number of times the Concept satisfies the metric is recorded. While winners are considered worthy of support by the Challenge sponsors, “winning” does not necessarily imply that the Concept will be successfully brought to market. However, since winning is fully dependent on the needs of the sponsors, and thus exogenous to the process by which the Concept was developed, and in the absence of better proxies for success, the winning concepts are chosen as an acceptable proxy.

Measuring the prevalence of HCD Attributes

For each of the 76 concepts, we measure the HCD attributes of each Concept by building off of the prior research mentioned above; specifically, we divide the HCD attributes into the above three phases—“Hear,” “Create,” and “Deliver”, focusing on both the breadth of disciplinary involvement as well as the factors listed in ISO9241-210. For each of these three types, we use a protocol coding matrix to encode the presence of different factors as either categorical or numeric values.

Challenges	# Inspirations	# Concepts	# Winners
How might we increase the availability of affordable learning tools and & services for students in the developing world?	269	104	9
How can we improve sanitation and better manage human waste in low-income urban communities?	122	68	9
How might we improve maternal health with mobile technologies for low-income countries?	278	176	10
How might we use social business to improve health in low-income communities?	290	97	10
Total	698	445	38

Table 1: Overall OpenIDEO challenge statistics for this study.

Hear

HCD attributes within the “Hear” phase can be split into two types of actions: collecting data about the users’ environment, and analyzing it to obtain an understanding of the needs of the community. We attribute these behaviors by analyzing information included in each submitted Concept, as well as in the prior inspirations the Concept was built upon. In Figure 7, for instance, if Concept (e) is the Concept under consideration, inspiration (a) and (c) are included as direct foundations, but (b) is not. We subject all information, except data in the comments section of an inspiration or Concept, to the following questions:

- *Is the design based upon explicit understanding of users, and tasks?*

To proxy consideration of the users, we set a binary variable if the designer considered demographic information of the users of the affected community, and the tasks they are required to perform.

- *Is there consideration of the environment in which they are engaged?*

This question was split into different ways the designer might think about the environment of the user, the cultural, ecological, political, economic, and technologic environments. We chose the following coding:

- *Did the designer mention facts or opinions that reflect the cultural/geographical reality of an impoverished user that someone outside of their community would not experience?*
- *Did the designer mention the current ecological impact of a community?*

- *Did the designer mention political or infrastructural aspects, which directly or indirectly affect the user?*
- *Did the designer mention current economic states, or economic impacts of the Concept that affects the user?*
- *Did the designer mention tangible technologies through which the user does, or will, interact with?*
- *How involved are the users in design and development?*

This question estimates the connection designers have with users. It is demarcated by four levels of user involvement. Community users may be co-designers, which means a member of the desired community is a registered designer on the IDEO website. The designer may use primary sources, meaning they have directly spoken to the end users. The designers might use secondary sources, which mean the data is obtained from someone who has interacted directly with users. Tertiary source use means another level of disconnection between designer and user, and it includes statistics and data from multilateral institutions such as the World Bank.

- *Does the design address the whole user experience?*

This question was translated into metrics which proxy miscellaneous important variables of the user experience. We searched for two separate indicators of user experience: the consideration of other stakeholders that would impact the success of the Concept, and if the designer considered the life cycle impacts of the intervention, including environmental life cycle impact such as recycling of the product or consideration of the global supply chain.

Create

To proxy ideation in the Create phase, we use a protocol that assesses the expansion and exploration of the design space by each Concept, and all other Concepts that act as a foundation for that Concept. In Figure 7, if (h) is the Concept under analysis, (g) is included as a prototyping influence and (f) is not included.

- *How many ideas?*

This metric asks how many Concepts directly impacted the chosen Concept. In Figure 7, (e) has zero concepts as its foundation; but (h) has two concepts.

- *What types of inspirations?*

We categorized each Concept into one of six categories: product, software, service, experience, business model, and policy interventions.

Deliver

Although the designs cannot be effectively prototyped to completion on the website, the designers often post preliminary prototypes during OpenIDEO's "Concepting" phase. The units of analysis are the chosen concepts, and concepts which act as a foundation for the chosen concepts. The design space was approximated through the breadth and depth of iteration, as well as the use of feedback. The relationships are equal to the Create phase: In Figure 7, if (h) is the Concept under analysis, (g) is included as a prototyping influence and (f) is not included.

- *How many prototypes?*

To proxy breadth of design contribution, this question encodes how many Concepts served as direct foundations for the chosen influences, and thus whether they considered more ideas as influences to their Concept. To prevent confounding with the similar Ideation question, Delivers are only included if they are separate ideas from the required Concept description.

- *Did they actively elicit/include feedback on the prototype outside of using comments?*

Concepts can be edited upon until the end of the Challenge date, and select users suggest certain edits that have been made, or different ways they've elicited feedback on the prototype. If they mention any way they've changed their Concept due to outside influence, they obtain a higher score here.

- *Did they answer comments on their prototype?*

Another easier way to elicit feedback is to answer comments on their Concept left by other designers. We record whether or not the Concept's original author responds to feedback on their comment by posting a comment in reply.

- *Is there any consideration of human-centered evaluation?*

This binary variable indicates whether the designer acknowledges that their Concept is not complete, and will require further evaluation, and possible modification, past the current phase.

- *How many branches of design concepts led to this winning design?*

This question was used as one proxy of how many times the design cycle was iterated. In traditional design, a designer, or group of designers, prototypes effectively by iterating the creation–evaluation loop many times. However, this manner of iteration occurs outside the influence of a single designer; the entire OpenIDEO community becomes the design community. In this framework, designers have little influence over prototypes which they do not create, but still uses the ideas to make their own Concept, By counting the maximum amount of times a Concept used another Concept as foundation, one can proxy design iteration by network depth. In Figure 7, for Concept (h), the depth score would be two, as (f) is two levels of Concept foundation from (h).

RESULTS AND DISCUSSION

We first present findings associated with the total set of Concepts, and then we present findings that result from a comparison of the two separate Concept pools across the same metrics.

Findings Across Concepts

There were certain HCD metrics that were considered in almost every single Concept, and some metrics that were barely considered by the chosen Concept pool. For instance, 89.5% of the concepts considered downstream stakeholders in addition to the end users, and 82.9% of the Concepts are services; but only six designers out of 78 (7.9%) considered the ecological impact of their Concept and only 13.2% of the Concepts are policy interventions. The full list of findings is in Table 2.

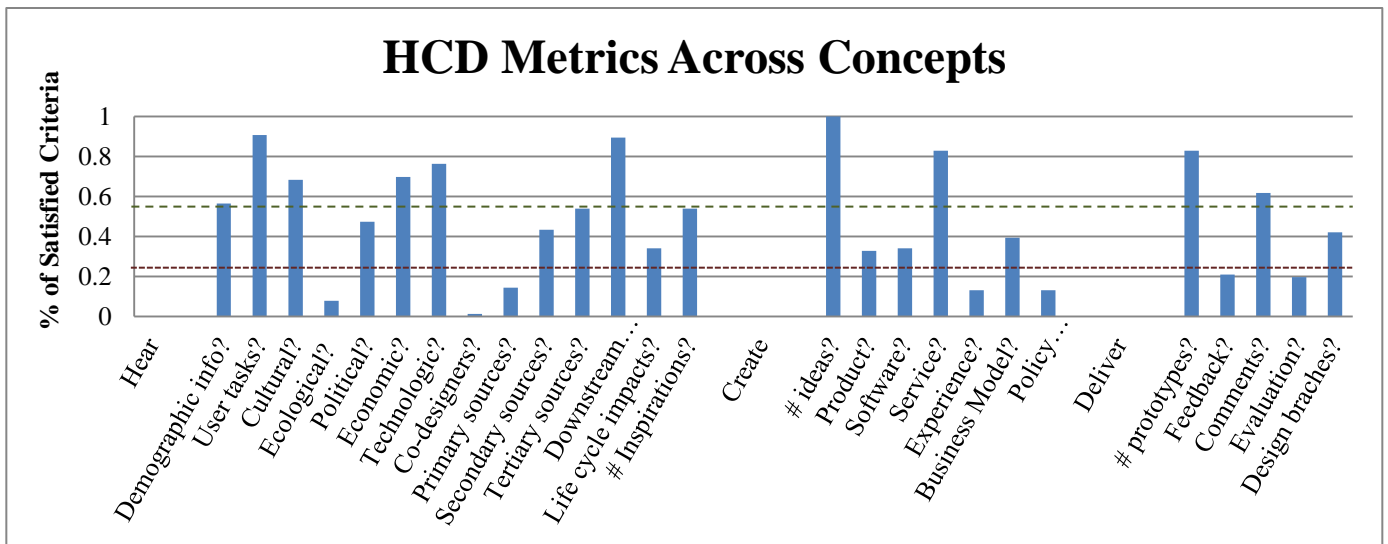


Figure 11: Percent of times HCD metrics were satisfied in total Concept pool. The higher dashed line demarcates metrics with high (>65%) satisfaction, and the low dashed line demarcates low (>25%) metric satisfaction.

The metrics about demographic information and user tasks were important litmus tests; without considering these basic qualities of users, designers cannot hope to conduct effective HCD. Fortunately, 56.6% of the concepts noted demographic information, and 90.8% of the designs noted the tasks the users need to complete. It is also intriguing that there was no statistical significance between the winners and the non-winners for these questions; both the winners and the users aimed to consider the user’s demographics and basic tasks.

A large portion of concepts from the full pool considered the user’s environments from multidisciplinary perspectives: 68.4% of the concepts from the pool considered the culture of the end users, 47.4% of the concepts considered the community’s political infrastructure, and 69.7% of the community considered the economic state of the end users. Each of these findings, as well, showed no statistical significance between the two Concept pools, meaning the winners and the non-winners both considered the user’s environment in multidisciplinary ways.

When the Challenge description prompted the designers to brainstorm ideas along a certain attribute, the designers were much more likely to include data concerning that metric. Challenges rarely mention the political infrastructure of the user communities; correspondingly, only about half of the designers included some political consideration in their concepts. In contrast, each challenge mentions specific communities, and thus specific cultures, to design for, such as Caldas, Colombia; Kumasi, Ghana; Burkina Faso; Bangladesh; or India. Moreover, multiple Challenges asked for economic considerations, such as the cost of a Concept or the creation of

specific business strategies in the Affordable Learning Challenge. This evidently impacts the almost 70% of the Concepts which include cultural and economic consideration. In the Maternal Health challenge, where economics was not directly stated, 12 out of the 20 ideas did not consider economics, compared to the Social Business challenge, where 19 out of the 20 concepts considered the economics of the user. Another example of the apparent power of Challenge prompts is the lack of human-centered evaluation. Human-centered evaluation was not included as a question, nor hinted at as an important metric for effective design, and subsequently only 19.7% of the design community included some mention of evaluation in the future. Interestingly, of the 76 concepts analyzed, only one Concept was developed by a designer who was physically located in the community for which the intervention was designed. Twelve of the 72 concepts utilized primary sources of user experience, in addition to secondary or tertiary sources. This suggests an opportunity for incorporating additional primary user research into the distributed design process.

Although few concepts (21.1%) mentioned a change to their Concept idea due to outside feedback, OpenIDEO members mainly provide feedback through the comments section. Although the comments on each Concept were excluded from the main content analysis, they were brimming with activity: 88.6% of the concepts had activity inside the comment section, and 61.8% of the members answered comments about their projects. Rich feedback occurs in the comments section regardless of outcome: there is no difference in the commenting behavior between winning and non-winning concepts. In all 16 instances where feedback was elicited, comments by other designers were answered by the Concept's designers.

Comparison of Winners and Non-Winners

For each HCD metric, we used two types of tests to find statistically significant differences between the pool of winning and non-winning concepts across the HCD metrics. For the numeric variables, we assumed the winning variables would have higher scores in each category than the losing variables; to test this, we ran one-tailed t-tests on each numeric variable. For the categorical variables, we operated under the assumption that if there was statistical significance of some dependence between categories, they would be between the winning categories having a larger amount of satisfied metrics; thus, we ran a Pearson's chi-squared test to test the null hypothesis of no significant difference between the Concept pools. For each test,

we operated under the assumption that the winning concepts would have higher metrics in every category than the non-winning concepts and set our type-I error rate at 0.05. We find that there are statistically significant differences between means and categorical relationships for many of the metrics. The statistically significant metrics across Concept pools are as follows:

- How many inspirations served as the foundation for the Concept?
- How many ideas were included as reference?
- How many of those ideas were services?
- Did they actively elicit feedback on the prototype outside of using comments?
- Did they answer comments on their prototype?

See Table 3 with the total list of statistical findings. Further research into each Challenge will show if there are true statistical differences between the samples.

None of the categorical Hear metrics are statistically significant. This means each Concept in the pool is likely to mention the same broad metrics in their design. Thus knowledge in this category was not a distinguisher for success in OpenIDEO. Future research should explore the depth of knowledge in these categories, instead of superficial acknowledgement of general disciplines. A related finding is that the difference in the average of foundational Inspirations between the two Concept pools is statistically significant; meaning more collected information is correlated with a higher likelihood of a winning Concept. Possibly, more in-depth knowledge with a focus on a certain field is worth studying.

Although a small percentage of the total Concept pool actively elicited feedback on the prototype (21.1%); our criteria showed statistical significance between the two Concept pools.

This is due, in part, to prompts developed in the Maternal Health design group, where winning designers were asked to resubmit new information after they became finalists, described in many of the Concept descriptions as “updates” or “builds.” Eight of concepts in Maternal Health updated their information using outside feedback after the interim Challenge prompt, while the non-winning concepts did not have this opportunity. This behavior serves as further evidence of the impact of prompting during the Challenges.

Unfortunately, one part of the study that should count towards HCD competence was not effectively documented: the counting of the disciplines, the last metric of ISO9241-210. Because designers have the option to omit certain information about themselves on OpenIDEO, there are

little options we have in finding out the disciplines of the designers. In fact, 35% of the Concept pool came from designers who did not list an occupation on their OpenIDEO profile page. Moreover, defining a discipline on OpenIDEO became a highly subjective enterprise. Though we aimed to connect seemingly related disciplines (i.e., ecological design and design thinking = design), such a method would be difficult to standardize and replicate. Moreover, the designers might define their disciplines altogether differently than our categorizations. Though we dropped the findings for disciplinary involvement, it remains an important part of HCD analysis, which requires more nuanced study. However, it was intriguing that people who work with OpenIDEO in some manner are highly active in the program (32.9%) and 46.1% of the contributors self-identified with the design discipline (e.g., social design, design ecology, etc.).

Limitations/Clarifications of Study

Though much was analyzed in this study, it still has its limitations. This study represents design success as being selected as a winning Concept by a challenge sponsor. We acknowledge the faults of this proxy: sponsors are likely influenced by disciplinary preferences, internal capabilities, and restricted funding and resources, which might dictate their choice of idea; so the choice of a winning concept does not mean a Concept has loads less potential than a non-winning one. Moreover, it must be stressed that though a ‘winning concept’ was used as a proxy, the true connection between a winning concept and a successful intervention is much more complex. A sponsor backing a concept must also be tangibly developed and brought to the community for consideration and likely go through many more design iterations before it is developed. The downstream process after the OpenIDEO main contribution is visible in the Human Sanitation Challenge: OpenIDEO publishes updates on the Realization phase of certain Challenges concepts. so designers can see how they progress. Though the Challenge was closed in January of 2011, the first toilets inspired by the challenge did not get to Kumasi until early January 2013. These processes take time, and many variables can contribute to the success and failure of an intervention that OpenIDEO cannot predict.

The collected data comes from OpenIDEO and information was only included if we could, for certain, verify its validity. Many realities about the designers, such as their connection to the community, or the amount of times and ways they elicited feedback, might be reflected fully in the OpenIDEO database. For instance, there were instances where designers were from the

country for which the Challenge was designed, such as designers in the Affordable Learning challenge from India, but it was unclear if they were from the socioeconomic or cultural environment of the exceptionally poor. Moreover, each Concept could be edited until the end of the Challenge phase; thus, the designers might have collected and used feedback on their Concepts, and we as researchers have no way of knowing it happened. This means there might have been larger numbers of satisfied metrics (more co-designers, for instance) than we could verify directly from the data in OpenIDEO. In the pursuit of objectivity, however, they were not included as co-designers. We cannot fix this issue, but in the grand scheme of things, this is really an issue of documentation for any design process. OpenIDEO, therefore, does much better than many other designers, due to its highly structured and analyzable, and relation-base dataset. Also, we must clarify certain realities about aspects of the research method. The statistical differences between metric values of winners and non-winners are in no way hard and fast laws. For instance, though a larger number of inspirations are correlated with winners, there are non-winning Concepts with many inspirations, and though answering comments on the prototype was statistically significant; there were many losing Concepts with losing prototypes. Future qualitative research that explores the depth of knowledge contributed by the designers, or possibly how that information is presented on OpenIDEO, would help elucidate these variations. Also, we acknowledge the definitions we use for ‘knowledge’ in particular fields also come with its own limitations: in reality, disciplines are deep and inextricably connected, and difficult to fully capture through OpenIDEO’s interface. Culture is more entrenched in a society than youth-led mobile libraries in India, political infrastructure are more widely impactful than local government institutions, and technological interventions are more varied than cell phone technologies. However, because this study focused upon breadth of information instead of depth, the definitions were deemed sufficient for a first look at OpenIDEO’s data. Future work should understand which aspects of these complex systems the designers consider important, so the data can be used to develop more appropriate HCD metrics.

Conclusions

We developed metrics for HCD usage within the OpenIDEO collaborative design platform, and used the metrics as a lens to analyze the presence of HCD attributes across a list of 38 winning concepts and 38 randomly selected non-winning concepts. We also highlighted statistically significant differences between the two Concept pools across each metric. One important finding is the efficacy of the use of prompts in project design. For example, it is not surprising that mentioning a specific factor in the design brief, such as economic constraints, inflates the proportion of submissions that specifically address that factor. This becomes most apparent when comparing emphasis on certain factors that substantially outweigh others (economics and technological influences, compared to the ecological consideration and human-centered evaluation). Indeed, there is power in asking the designers the right question; if OpenIDEO developers want certain aspects of the design process to be considered, such as how the products should be evaluated such concepts should be evaluated once upon the ground, one should build prompts into the brief to ask such questions.

Another important point of consideration in this OpenIDEO analysis, especially in the context of design for and with the poor, is how this study fits in the nexus of the digital divide, or the lack of information and communication across economically disenfranchised groups in ICTD and HCD. Our findings concerning designer-user intimacy directly reflected the issues of remote design; many designers used secondary and tertiary sources for their concepts; but only twelve designers definitively used primary sources, and only one Concept referenced a designer who was, with certainty, actually from the community they aimed to help. While there might be more primary sources and co-designers involved outside of our non-representative samples, indigenous co-designers were not included as contributors to any winning concept. More participation can only assist the design process, especially if the communities who contribute use the products in the end. These findings suggest the reality of the digital divide in our society. Fortunately, this criticism is not without good news and the possibility for change. The reality is, a main advantage of OpenIDEO is designer's diversity; OpenIDEO has designers from over 170 countries across the world⁶⁷, and great contributions can come from any of them. However, more can be done to have indigenous communities more involved in the design process. The onus is not only on OpenIDEO to fix digital divide issues; issues of the digital divide are intertwined

with a complex array of factors, including content and language, literacy and education, and community and institutional structures⁶⁸. By making collaborative design platforms, such as OpenIDEO, more accessible to the impoverished communities they aim to help, this trend can be reversed.

This study makes an important contribution to a missing link in the design thinking literature: a tangible, way to measure how well HCD is actually conducted during a design process. Using these metrics, one can ask specific questions about measuring design effectiveness, or charactering how designers frame the user's needs and reality: Do they leverage interdisciplinary knowledge? How close are they to the users? Are their ideas many and varied? Do they iterate their prototypes and elicit feedback? On the other side of the coin, these metrics of HCD competence can be used to test the effectiveness of HCD on established design processes. By using the metrics to label certain design processes as appropriately HCD, we can find out if said design process is more or less effective at developing effective solutions. We encourage further modifications, testing, and improvements metrics for evaluating HCD usage.

Moreover, the collected data serves as a transition point for ways that OpenIDEO can design better, together. One thing OpenIDEO employees might do to improve the design experience is further data analysis of the massive amounts of contributions, presented at each Challenge phase. In traditional research protocol, and in HCD methods, data is not just presented in raw form; it is coded and analyzed, just like the metrics in this paper, so designers can better map out future design directions. However, it is nigh impossible for a designer to analyze the massive amounts of data on the website. For example, a more recent open design Challenge, "How might we make low-income urban areas safer and more empowering for women and girls?" had a total of 772 research contributions at the time of this writing. For comparison, the analyzed Concept that had the most referenced ideas altogether only had 60 referenced separate ideas. Moreover, most of the Concepts referenced far less contributions. It makes little sense for any designer to sift through the massive amounts of data on the site; thus a framing of the developed research is likely to be of assistance. To do so, OpenIDEO employees or designers might use 2x2 matrices, storyboards, mind maps, or the many other techniques in the text, *Observing the User Experience*, to understand the totality of OpenIDEO data⁴⁸.

Another aspect OpenIDEO developers could focus on is how is to motivate designers to craft effective stories about their products. Many of the Concepts explained how the intervention

works, and why it is important, but few developed a context where they outline the user's environment, they detail the needs of the user, and they introduce the intervention as a solution. Storytelling techniques can fill that void. Just like analysis and coding gives designers a shape to the raw data, a back story of the community's reality and issues gives products meaning and cultural form. Nancy Duarte's text *Resonate* explains that stories are the most powerful delivery tool for information; by empathizing with characters who have real challenges, and by understanding the character's logic, we can express why communities have such systematic issues, and what we can do to address them⁶⁹. Certainly there is more than enough data collected during the Inspiration phase to develop rich personas and scenarios which drive the need for innovative products.

However, OpenIDEO developers should be careful if they wish to change the platform. The suggested changes, if performed incorrectly, might overly confuse OpenIDEO designers, or frame them into answering the wrong design questions. We see the impact that framing questions have in IDEO, and developing a framework for design opportunities might constrain the mindset of the designers. For example, let us say for a certain design challenge, we tell the OpenIDEO designers to research and brainstorm pink elephants. However, for the particular problem, a blue platypus might be an equally valid solution. One must take care that, all animals of all hues are considered, while learning which questions direct the designers most effectively. Moreover, OpenIDEO developers and managers should take into account the practical capability of these recommendations. One of OpenIDEO's fortes is its ability to distill complex of design thinking mindsets into simple, concrete challenges and suggestions. One must not introduce new tasks for the designers that they cannot understand; less understanding means less contributions, which means less innovative and actionable ideas.

Future research on this topic can proceed in many different design directions. The simplest further research is to go wider, and deeper, into OpenIDEO. There are sixteen other challenges that can be analyzed using these metrics, and each of the four challenges selected have hundreds more concepts to be analyzed. Also, while this paper uses HCD metrics to analyze data from OpenIDEO, the proposed methodology can also extend to other design communities or design initiatives. One can use HCD-verified design techniques, using the framework in this paper, to compare this process to other design methodologies, or to find the effectiveness of those aiming

to do HCD. For instance, with a few tweaks, one can analyze how user-centered are MNCs when they do research upon emerging markets.

An important finding of the theory, however, is the massive complexity of the field that purports to design products and services for the poor. There are no simple solutions, no easy ways to solve these issues; if there was, they would have already been solved. The global movement of designing products for the poor is a present reality, and its influence is only increasing on the world stage. A certain reality of our global society is its interconnectedness; everyone impacts everyone else in intricate, novel, implicit, and many times, hurtful ways. However, our connections don't have to be hurtful. It is the opinion of the author that the skills, networks, and resources of all communities committed to fighting inequity should be leveraged to fix our problems. Why not use what we have, to solve what we have caused?

To do so, however, just as was found in the OpenIDEO data, accurate prompting is critical. Just as OpenIDEO designers framed their thought around the right questions, we as a community must do the same. Moreover, by asking the right design questions, we must also ask who has the capacities to solve them. In that search, HCD serves as a powerful toolkit. That being said, it cannot do it alone, nor will other design philosophies and influential actors in isolation. Just like 'hammer looking for a nail' design has caused more problems than it has solved, not every poverty-centric issue should use HCD. Moreover, knowledge about design thinking, like any field, is fluid and discursive, and HCD in a few years might not look like HCD today. Today, however, the methods of hearing, creating, and delivering solutions influenced by design thinking can push the needle forward. By acknowledging the reality of our ignorance, and by working with those driven to make a difference, we as designers can also progress through our pursuit of design for development.

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Appendix: Supplementary Experimental Results

Table 2: HCD Metrics Results Across Total Concept Pool

HCD Metrics	% of total times criteria fit across Concept pool
Hear	
Do they note demographic information of the users?	56.6%
Is there consideration of the tasks that the users have to perform?	90.8%↑
(Is there ____ consideration of the environment in which they are engaged?)	
cultural?	68.4%
ecological?	7.9%↓
political?	47.4%
economic?	69.7%
technologic?	76.3%↑
Are users co-designers?	1.3%↓
Are users primary sources?	15.8%↓
Are users secondary sources?	44.7%
Are users tertiary sources?	53.9%
Does the design consider other downstream stakeholders besides the users?	89.5%↑
Does the design consider life cycle impacts of its implementation?	34.2%
How many inspirations served as the foundation for the Concept?	53.9%
Create	
How many ideas?	100.0%↑
Was the idea a Product?	32.9%
...Software?	34.2%
...Service?	82.9%↑
...Experience?	13.2%↓
...Business Model?	39.5%
...Policy Intervention?	13.2%↓
Deliver	
How many prototypes?	82.9%↑
Did they actively elicit feedback on the prototype outside of using comments?	21.1%↓
Did they answer comments on their prototype?	61.8%
Is there any consideration of user centered evaluation?	19.7%↓
How many branches of design concepts led to this winning design?	42.1%

↑ = the category was satisfied at a high frequency (>65%) across the entire study.

↓ = the category was satisfied at a low frequency (<25%) across the entire study.

Table 3: HCD Metrics Results Between Winning and Non-Winning Concept Pools

HCD Metrics	Probability of Statistical Significance between Concept pools
Hear	
Do they note demographic information of the users?	0.720
Is there consideration of the tasks that the users have to perform? (Is there ____ consideration of the environment in which they are engaged?) cultural?	0.702
ecological?	0.273
political?	0.868
economic?	0.593
technologic?	0.383
Are users co-designers?	0.761
Are users primary sources?	0.798
Are users secondary sources?	0.313
Are users tertiary sources?	0.590
Does the design consider other downstream stakeholders besides the users?	0.723
Does the design consider life cycle impacts of its implementation?	0.170
How many inspirations served as the foundation for the Concept?+	1.000
How many inspirations served as the foundation for the Concept?+	0.035*
Create	
How many ideas?+	0.008*
Was the idea a Product?+	0.236
...Software?+	0.060
...Service?+	0.007*
...Experience?+	0.252
...Business Model?+	0.172
...Policy Intervention?+	0.021
Deliver	
How many prototypes?+	0.337
Did they actively elicit feedback on the prototype outside of using comments?	0.001*
Did they answer comments on their prototype?	0.024*
Is there any consideration of user centered evaluation?	0.557
How many branches of design concepts led to this winning design?+	0.134

* = the category recorded statistical significant differences between the winners and the losers.

+ = the category was numeric in nature, and we used one-tailed t-test for statistical significance. If the category has no indicator, it was categorical, and Pearson's chi-squared test was used.

Table 4: Numeric Metric Average Scores Difference Between Winning and Non-Winning Concept Pools

Average Score for Numeric Metrics	WINNERS	NON-WINNERS
Hear		
How many inspirations served as the foundation for the Concept?	5.342	1.684
Create		
How many ideas?	2.184	1.421
Was the idea a Product?	0.526	0.395
...Software?	0.632	0.342
...Service?	1.684	1.026
...Experience?	0.158	0.105
...Business Model?	0.816	0.579
...Policy Intervention?	0.211	0.053
How many disciplines were involved in the making of the ideas?	1.579	1.079
Deliver		
How many prototypes?	3.316	2.711
How many branches of design concepts led to this winning design?	1.158	0.789
How many disciplines were involved in the making of the prototypes?	1.526	1.132

Table 5: Percentages of Categorical Metric Satisfaction Between Winning and Non-Winning Concept Pools

Cumulative times categorical variables were satisfied	WINNERS	LOSERS
Hear		
Do they note demographic information of the users?	31.6%	25.0%
Is there consideration of the tasks that the users have to perform?	47.4%	43.4%
(Is there ____ consideration of the environment in which they are engaged?) cultural?	39.5%	28.9%
ecological?	2.6%	5.3%
political?	27.6%	19.7%
economic?	39.5%	30.3%
technologic?	40.8%	35.5%
Are users co-designers?	0.0%	1.3%
Are users primary sources?	11.8%	2.6%
Are users secondary sources?	25.0%	18.4%
Are users tertiary sources?	30.3%	23.7%
Does the design consider other downstream stakeholders besides the users?	48.7%	40.8%
Does the design consider life cycle impacts of its implementation?	17.1%	17.1%
Deliver		
Did they actively elicit feedback on the prototype outside of using comments?	19.7%	1.3%
Did they answer comments on their prototype?	39.5%	22.4%
Is there any consideration of user centered evaluation?	13.2%	6.6%