Creating an essential marketplace to close the information gap for social impact technologies

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This research examines the use of market mechanisms to not only distribute social impact technologies but also to collect data about the technologies and their customers' behaviour. Essmart, a last-mile distribution social enterprise operating in Tamil Nadu, India, addresses technology for development's distribution and information gaps with a transparent, closed-loop feedback system that incorporates all relevant factors. Market-based distribution and data are vital to the success of creating social impact through technology.

Keywords: Data, development, distribution, rural, technology.

Introduction

AFTER decades of failed grassroots-level poverty alleviation initiatives, social impact technologies – also known as 'frugal innovations' and 'appropriate technologies', among other names – have grown increasingly popular worldwide, developing innovative solutions to address a wide range of technological and societal challenges. These include treadle pumps and drip irrigation systems for low-income rural farmers and off-grid solar lighting solutions, among others. Explicitly designed for Bottom of the Pyramid (BOP) end users, these technologies are anchoring the global technology-for-development ecosystem.

With this growing emphasis on BOP end users, the idea of 'design for the other 90%' has been described as a 'growing movement'. Paul Polak, founder of International Development Enterprises and author of *Out of Poverty*, describes the current product design situation like this: The majority of the world's designers focus all their efforts on developing products and services exclusively for the richest, 10% of the world's customers. To reach the other 90%, nothing less than a revolution in design is needed[1]. Globally, there are organizations, foundations, and academic institutions that support the invention of technologies for development and the organizations bringing them to market, like USAID's Development Innovation Ventures and MIT's D-Lab.

Many technology-for-development initiatives are also taking place in India. For example, the first ever TATA Social Enterprise Challenge was hosted at IIM Calcutta in February 2013 to identify two of India's most promising social enterprises[2]. The first winner of the competition was Greenway Grameen Infra, a manufacturer of improved biomass cooking stoves that reduce fuel consumption and smoke emissions. The second winner was Ottoclave, an affordable, speech-enabled, pressure cooker-based autoclave that sterilizes hospital instruments. Additionally, Sam Pitroda's National Innovation Council espouses 'frugal cost' products that are affordable for low-income citizens and seeks to foster an 'innovation eco-system across domains and sectors to strengthen entrepreneurship'[3]. Pitroda is also the Honorary Chairman of Action for India[4], an organization with the goal of 'scaling social impact through technology.' In early 2013, winners of its Growth Prize included NURU Energy, a company that designs and manufactures affordable solar lights. Furthermore, in April 2013, Centre for Innovation, Incubation, and Entrepreneurship, IIM Ahmedabad and Village Capital hosted the first India-based accelerator programme for technology-for-development, for-profit start-ups[5].

Whereas it is impossible to dismiss the contributions of well-intentioned engineers who design life-improving technologies, one must acknowledge the gaps that mere technology invention cannot fill. The first gap is the distribution of social impact technologies, which has historically been left to non-governmental organizations (NGOs), government programmes, or the manufacturers themselves. Unfortunately, none of these distribution models are scalable or financially sustainable. Non-profits generally suffer from a dependency on charity and a strong disconnect between funders and beneficiaries. Government programmes often lack proper oversight and short-term projects. Manufacturers lack the expertise and resources needed to execute a proprietary distribution model.

Although last-mile distribution is generally an unrecognized and underfunded problem, the tide is slowly shifting with the creation of distribution-focused social enterprises (small to medium enterprises that use a business model to achieve social goals). Although 'distribution' is an uncommon funding category compared to popular silos such as 'energy' or 'health and sanitation', a few organizations have begun to recognize the need to financially support it. For example, March 2013 marked the launch of the D-Prize, which focuses exclusively on

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'better ways to distribute proven life-enhancing technologies'[6].

However, distribution is just the first gap in the technology-for-development ecosystem. The second gap – the information gap – exists between technology designers, funders, distributors and end users. The information gap has equally heavy implications on the social impact that technologies can deliver in the development context.

In the technology-for-development ecosystem, information is asymmetric because there is no market for these products. When NGOs distribute social impact technologies, donors dictate what products are distributed without understanding what end users value. NGOs may also offer technologies at no cost or at a subsidized cost, which arguably affects how end users perceive the products' value and their adoption of the product. Similarly, when a manufacturer pushes its own products through a proprietary distribution channel, the company only moves its own product. Unless another manufacturer is selling a similar product in the same market, end users cannot make an educated decision about what product is preferred.

A transparent, competitive, economically incentivized marketplace for social impact technologies has the potential to revolutionize the technology-for-development ecosystem. Not only would a marketplace give end users the opportunities to choose what they want based on the value of the product, functionality and price, but a marketplace would incentivize designers to create more desirable social impact technologies. A marketplace would also create a platform for data collection on end users' technology preferences and buying habits.

This case study examines the use of market mechanisms to disseminate social impact technologies and illustrates the potential of a company to assess and alleviate the current shortfalls in distribution and information. Essmart, a social enterprise operating in Tamil Nadu, India, addresses both the distribution and the information challenges in the technology-for-development ecosystem with a transparent, closed-loop feedback system that incorporates all relevant supply chain actors. Within this system, a more egalitarian marketplace emerges, benefitting stakeholders from the beginning to the end of the supply chain. In this marketplace where products are bought and sold, end users become demanding customers whose opinions and preferences matter and are thus able to engage with distributors and producers for better products and services.

When analysed as vital data, end customers' buying decisions and feedback become focal in motivating manufacturers to design better technologies for social impact. This paper highlights strategies of the Essmart for closing the information gap through data collection within its marketplace. When shared with stakeholders, this data will greatly multiply the effectiveness of life-improving technologies.

A brief history of social impact technologies

The appropriate technology movement's roots in Schumacher's intermediate technology

Technologies for development were conceptualized in response to the failure of the post World War II growth models, which utilized capital-intensive, large-scale development strategies. Aid programmes were designed to promote the same pattern of industrialization previously exhibited by developed nations, namely through mechanized agriculture, large factories and infrastructure development like power plants[7]. By the 1970s, it had become evident that efforts to achieve economic growth through these methods were failing to create equitable growth. Dual-economies became the norm as urban islands of high productivity emerged while agricultural peripheries were neglected[8].

In response to the situation, British economist E.F. Schumacher proposed the concept of intermediate technology, symbolically defined as a technology that falls between an indigenous technology costing US$ 1 and a western technology costing US$ 1000. Inspired by Gandhi's visions of *Gram Swaraj* (self-sufficient but interlinked village republics with decentralized small-scale economic structure and participatory democracy) and *Sarvodaya* (Gandhi's ideal political philosophy meaning 'universal uplift' or 'progress for all'), Schumacher visualized the use of these 'intermediate technologies' in an alternative form of development that would occur alongside large-scale industrialization. 'Such an intermediate technology would be immensely more productive than the indigenous technology (which is often in a condition of decay), but it would also be immensely cheaper than the sophisticated, highly capital-intensive technology of modern industry[9].

This concept expanded to include any small-scale, inexpensive, easily maintained and labour-intensive technology – with an emphasis on local development and production – that increases productivity and eventually bridges the gap to more sophisticated technologies. These technologies, often called appropriate technologies, were the focal point of a technology-for-development movement in the 1970s and 1980s. However, by the 1990s, the movement was slowing down. Funding for appropriate technologies was slowing down; countries were turning toward adopting an export-orientation for growth, and interest in grassroots development was waning[10]. Additionally, the appropriate technology movement was having less impact than expected. Although engineers were designing 'better mousetraps', very few people were using them[11]. Participants naïvely assumed that appropriate technology would be readily adopted once end users saw the technology's utility. By not realizing that appropriate technologies, despite their simple designs, benefited from support like training, maintenance and administrative

assistance, organizations were setting up their own demise[12].

Despite the appropriate technology movement's death, the belief has persisted that more appropriately designed technologies can provide a way out of poverty for many of the world's poor. This is reflected in the efforts of organizations in today's technology-for-development space.

The current misguided focus on core design

Today, international development organizations and initiatives focusing on core design are abundant. The first national engineers without borders organization was founded to 'promote the implementation of sustainable development through critical practice of engineering'[13]. iDE is a non-profit that creates income-generating activities in rural areas through the use of agricultural technologies[14]. *D.light Design* invents low-cost solar-rechargeable LED lanterns[15], and doing the same are many other social enterprises. University programmes that teach students how to design for the BOP context have also emerged, including the Centre for Sustainable Technologies, Indian Institute of Science.

The public eye is consistently drawn to the core design of social impact technologies, not their more complex and less appealing models for dissemination or information collection. However, no matter how well-designed social impact technologies may be, there is no guarantee that they will reach the millions of people for whom they were created. Even if the products do reach people, there is no guarantee that users will benefit from them in the long term. For example, after receiving millions of dollars in grants, multiple sources, including UNICEF, reported numerous broken PlayPumps (water pumps that were designed to use playing children's energy to operate) and dysfunctional maintenance lines[16–18]. Likewise, Lifestraw, a hand-held water filter designed to be used like a straw, was able to distribute hundreds of thousands of units to end users free-of-charge by supporting its manufacturing through carbon credits. Kevin Starr, Managing Director of the Mulago Foundation, visited 20 recipient households in Kenya and found that only three filters were still in use[19].

When they were invented, both PlayPumps and Lifestraw were heralded as world-changing by funders, development professionals, and the media. Unfortunately, after the technologies were distributed by charitable means, no responsible parties monitored the social impact of these technologies. By the time studies were made, money had already been wasted on technologies that were not being adopted and the communities were already dealing with the negative consequences of being passive recipients.

Using market means for social impact technology dissemination

The demise of the appropriate technology movement has taught us that financial sustainability must be a crucial consideration for today's technology-for-development initiatives. According to Paul Polak, developing practical and profitable new ways to cross the last 500 feet to the remote rural places where poor families now live and work is the first step towards creating vibrant new markets that serve poor customers[20].

The idea that profitable business ventures could be created while generating social value at the BOP was first articulated in August 1999 by C. K. Prahalad and Stuart Hart[21]. Prahalad later published his influential book, *The Fortune at the Bottom of the Pyramid*, in 2004 (ref. 22). These writings initiated multinational corporations' attempts to enter BOP markets through repackaging and low price points[23].

Around the same time, Clayton Christensen, a Harvard Business School professor, was applying his theory of 'disruptive innovation' to the BOP with Hart[24,25]. 'Disruptive innovations' are new technological innovations, products, or services that create new markets and new value networks while eventually surpassing and disrupting dominant paradigms[26]. They, too, could be applied to the BOP – a huge market that most multinational corporations ignored.

The ideas of Prahalad's BOP businesses, Christensen's disruptive innovation and Schumacher's appropriate technologies have morphed and merged overtime. The emphasis on multinational corporations has decreased, and small companies and social enterprises began implementing these ideas. Known BOP scholars have written that these new BOP initiatives should see low-income individuals as not just consumers, but also as entrepreneurs[27], business partners[28], and co-inventors of goods and services[29]. However, after their survey of 1999–2009 BOP literature, Kolk, Rivera-Santos and Rufin discovered that the vast majority of initiatives view the poor primarily as consumers[30].

This paradigm shift from seeing BOP individuals as rights-bearing beneficiaries to seeing them as value-driven customers has caused some discomfort in development professionals and academics[31]. However, this shift should be seen as empowering for low-income populations, who are now treated as active agents within a consumer market instead of passive recipients. Companies that want to do business with the BOP must address their customers' spending needs, demands, desires and constraints. As described by the director of UK-based business fights poverty: 'for too long development has been about treating poor people as recipients, as dependents [sic], and actually for the first time we're seeing them treated as agents of their development … as customers for the first time'[32].

The concept of selling social impact technologies to low-income customers is relatively new. However, it has huge potential to scale the impact of these life-improving products by distributing them in a way that is financially sustainable and by creating a platform for collecting market-based information on social impact technologies and their consumers.

The need for market-based information about social impact technologies and their customers

Understanding the current information gap

At the moment, there are huge information gaps in the technology-for-development ecosystem. Social impact technologies have been historically distributed through charity-based means in which end users are passively receiving what is offered to them. These end users have no information on other similar products that they may prefer, and even if they did, they do not have access to them.

Although participatory design of social impact technologies has become common practice since its emergence in Scandinavia in 1970s (ref. 33), it does not necessarily guarantee that products will be viable on the market. Participatory design incorporates user perspectives during the design process through activities like prototype building and role-playing with end users. Related to participatory design is co-creation, which is a process of technology development that is done in partnership with relevant stakeholders. In co-creation, 'local users are involved from conception, thereby steering technology development in the direction most aimed at beneficiaries' needs and the local context'[34]. With respect to the design of social impact technologies, the term 'co-creation' has been used to refer to any type of intensive end user engagement during the design process. However, few designers incorporate the market as a forum for co-creation experiences, which differs from the more mainstream idea of the term that focuses on the co-creation of value by customers and companies[35]. The discrepancy exists because products designed for low-income customers are generally still acquired by users through non-commercial means. Although non-paying end users can give input into the design of an appropriate technology for their needs, designers will not necessarily incorporate what the end users financially value because the end user is not the end customer of the product.

Thus, despite end user input, there is still a lack of information in the technology-for-development ecosystem because of how social impact technologies are broadly distributed. There is no competitive, transparent marketplace for these products, so it is difficult for designers to collect information about what customers value and are willing to pay for, especially when given multiple choices of similar offerings. Therefore, designers are prone to reinventing the wheel instead of improving upon and scaling up existing inventions. For example, Alice Amsden, the late development specialist, identified the similarities between small-scale technologies that are invented today with those developed in the late 1950s[36]. She notes that, in 1958 novel entitled *The Ugly American*, an engineer offers his technical assistance on a simple bicycle-powered water pump[37]. Ironically, young engineers are still designing bicycle-powered technologies.

Finally, the lack of information in the technology-for-development ecosystem affects which technologies are funded. Even in charity-based models for distribution, donors are disconnected from beneficiaries and will choose products based on a limited understanding of user needs. Since there is little information about the quality of and users' experiences with social impact technologies, donors cannot make the most informed decisions. The lack of information about past and present social impact technologies also affects what new social impact technologies are funded. When there is no information about what products work (and do not work) and what users want (and do not want), it is easy for funding to support the most eye-catching, heart-warming new products, which are not necessarily the most viable or desirable by users.

In an attempt to address the scarcity of information on social impact technologies that already exist, NGOs and research organizations have begun to compile lists of existing social impact technologies for awareness creation and assessment. For example, Kopernik, which coins itself as a 'technology marketplace' for NGOs, creates an online catalogue of social impact technologies for NGOs to purchase and distribute to their beneficiaries[38]. The NGOs submit technology feedback reports, which are published online. MIT's D-Lab and Department of Urban Studies and Planning's Comprehensive Initiative for Technology Evaluation (CITE)[39], the World Bank and International Finance Corporation's Lighting Africa[40] establish product testing protocols, conduct in-house laboratory testing and product reports. Finally, the Cambridge, Massachusetts, USA-based Technology Exchange Lab is an online platform that connects a catalogue of technology solution providers with solution seekers (e.g. farmers and non-profits doing development work on the ground in the developing world)[41].

Although these organizations collect information about quality of social impact technologies and user experiences, they suffer from three gaps that affect the utility of the information in scaling the social impact of these products. First, because social impact technologies are distributed through charitable means, organizations cannot assess market of the social impact technologies viability or competitive advantage compared to similar technologies. These organizations cannot gather feedback on customers' price sensitivity or the monetary value that customer place on certain components of a new technology. Furthermore,

because charities generally distribute one social impact technology of a particular category, the data does not determine which brand or model is best in class. For example, no NGO offers end users the choice to purchase a D.light solar lantern, Greenlight Planet solar lantern, or a Barefoot Power solar lantern at retail price. As a result, it is difficult to determine which lantern users value most and why they have these preferences. Consequently, money, time and effort are being invested into products that have no commercial potential. When there is no commercial potential, the products will not reach enough users to create large-scale social impact.

Second, paying customers rarely contribute directly to product assessments. Quality testing is generally done in a laboratory, not in much harsher real-life situations, and user feedback is generally collected through surveys conducted by NGOs or researchers. The data is collected from products that have been given to users at no cost, and the period of use prior to the survey administration is relatively short, in the time frame of weeks, not months. Rarely do users purchase the technology and then voluntarily provide feedback after months of using it. Because no financial sacrifice is linked to the product, the usage time period is short, the data is often filtered through multiple parties, the collected data can be biased.

Third, whatever information these organizations collect is not useful to potential technology end users, who are generally low-income, non-English readers. Even if potential end users were offered with a suite of social impact technologies to choose from, they would not have access to the feedback that has been collected by the aforementioned NGOs and research organizations. Although valuable to certain parties within the social impact technology ecosystem, online reports – the primary means of information dissemination – are generally inaccessible to potential technology end users. The lack of information made available to end users results in asymmetric information that negatively affects how well they can demand for better products that are designed for what they value.

Filling the gap with market-based information on social impact technologies and their consumers

The current attempts to collect information about social impact technologies do not gather market-based information, and they do not close the feedback loop between the inventors and the users of these products. Therefore, what infrastructure needs to be created such that relevant information is collected and shared? The solution can be found in the combination of first creating a market for social impact technologies and then collecting market-based data on the technologies and their consumers.

The creation of a marketplace for social impact technologies has been discussed in other research[42]. However, the collection and utilization of market-based data about these products and their customers has not been fully explored. Practices from mainstream business can be applied to the commercialization of social impact technologies. For example, in all markets, sales data is used to determine whether the price is right, how a product or service is faring against competitors, and whether marketing initiatives are effective. Additionally, extensive analysis on consumers is a growing practice. For example, Target, an American retail chain store, uses market data on buying habits and the science of habit formation to execute targeted marketing campaigns that increase sales. After heightening its focus on items and categories that appeal to specific segments, Target's revenues increased from US$ 44 billion in 2002 to US$ 67 billion in 2010 (ref. 43).

Market-based data analytics naturally focuses on markets and people who are willing and able to pay. Consequently, these services have mostly ignored low-income, rural India. However, with increasing purchasing power, rural India is emerging as a huge market that companies cannot ignore. According to the National Council for Applied Economic Research, rural India accounted for about 22% of computers sold, 29% of refrigerators, 32% of cars and 46% of televisions. Market research companies like Hansa Research India have begun specializing in studying rural India[44], since businesses are realizing that there is huge market potential there.

But even as large companies are searching for the fortune at the bottom of the economic pyramid, social impact technologies like solar lanterns and smoke-reducing cooking stoves have not benefited greatly from market-based data analytics. There are so many questions that market-based data could answer: What are baseline design criteria for technologies like water filters, improved cooking stoves, and solar lanterns? What are affordable price points? What are preferred product features, and what are willingness of end users to pay for them? How do market preferences differ by region?

These questions still remain because, historically, there did not exist a market for these products. In the charity-based distribution model, social impact technologies do not compete directly against each other, and users do not have the option to choose which brand or model best suits their needs at a given price. The lack of a market resulted in a lack of data collection, which has contributed to the lack of ability to scale the social impact of these technologies.

Essmart: a distribution channel that collects information and closes the feedback loop

Essmart is a social enterprise that commercializes social impact technologies in peri-urban and rural mom-and-pop shops (a.k.a. kirana shops) of south India. As a process

innovation, the business' mission is to take existing life-improving products that are designed to benefit the people. Although primary operations of the Essmart are marketing, distributing, and servicing social impact technologies through existing kirana shops, the company also collects localized data about customer technological preferences, market demand and household needs. The data collection and sharing process creates a closed-loop feedback system for social impact technologies, which supports the global innovation-for-development ecosystem.

At its core, Essmart creates a channel for life-improving technologies to move from manufacturers into the hands of people who are intended to benefit from them. The social enterprise leverages the existing retail shop network of 15 million stores[45], where trust-based buying relationships are already established among 192 million households in India[46]. Essmart selects high-quality social impact technologies for a catalogue, and sales executives demonstrate the technologies in local shops, distribute products to shops, and ensure after-sales service through facilitating manufacturers' warranties.

As Essmart moves products through this distribution channel, the company collects information about preferences of end users, spending habits, technological needs, and experiences with the products. This information is gathered through discussions with shop owners and their customers during product demonstrations, periodic follow-up phone calls with technology end users, and end users who contact Essmart directly. In addition to qualitative feedback, Essmart also uses its distribution network to run randomized controlled trials that evaluate aspects of a product such as pricing, the effect of marketing techniques on product sales, and the consequence of warranties on customers' willingness to pay. Therefore, as Essmart scales, its distribution platform becomes a vital platform for market-based data collection.

Processes for bridging the information gap

Identifying technologies for catalogue inclusion

Identification of catalogue items is paramount to the efficacy of services and product of the Essmart. Sales executives of the Essmart ask shopkeepers and end customers to define and explain their specific needs, or customers initiate the identification process with their direct requests for products. The Product and Catalogue Development team searches for existing technological solutions that meet these needs.

Since its operations began in August 2012, Essmart has received many technology requests. These have ranged from an affordable headlamp to a device that identifies leakages in cans of liquid petroleum gas. In some cases, such as that of the affordable headlamp, the Essmart team has been unable to find a suitable solution. However, they have made this request known to product designers and hope to see one come through the product development pipeline.

In addition to end users providing feedback, suppliers also approach Essmart with commercially available products to sell to rural end users. These typically small technology designers and suppliers require a third-party distributor, particularly when the designers sit far from their target markets.

Product and market testing for existing technologies for catalogue inclusion

For all of its suppliers, technical specifications of the Essmart tests products and market response prior to adding them to the catalogue. When testing technologies to include in the catalogue, the product and catalogue development team, sales executives, and shop owners use the sample products in everyday scenarios to assess their usability and quality.

The shop owners are particularly vital in this process of testing new products for Essmart's catalogue. Because they know technology end users as customers, they can assess value for money and can gauge whether the products will sell in the market given its price, features and quality. Shop owners are also able to compare the new technology with the other technologies in Essmart's catalogue, and their sales of the product can assess whether retail is a feasible distribution method for that particular item.

Essmart deals primarily with shops as customers, but Sales Executives gain access to end users through their shops. In certain cases, a product is tested in a pilot household or in a pilot field. Essmart's product and catalogue development team surveys the end user about demographic information, product usage, product satisfaction, and overall feedback on the product and Essmart's service. After a consideration period of one month, a decision is made regarding whether to include the technology in the catalogue.

Through direct feedback, Essmart is building a database of critical information about these products, their capabilities, and their desirability. When collected en masse with end user demographic information, this data can paint a picture of overall satisfaction for not only all of Essmart's end users but also groups of end users, as defined by specific demographic characteristics. These data assists Essmart in identifying where educational outreach needs to be strengthened, determining how targeted marketing can be effective for future products, and collecting information for technology suppliers to improve their offerings.

During its first few months of distributing social impact technologies, Essmart has collated specific lessons around preferences and marketability of certain products.

For example, several end users have requested more direct white light as opposed to the softer and dispersed yellow light that comes with one of Essmart's most popular solar lanterns. These end users prefer white light because they perceive it to illuminate rooms better and, in some cases, their work requires white light (e.g. weavers who need to see the actual thread colors). Additionally, end users also prefer products that have multiple features. These are seen as increased value for money; even though one solar lantern model costs twice as much as another, one reason it is more highly desirable is because it comes with a built-in mobile phone charger.

Of course, not every tested product makes it into the Essmart catalogue. General concerns shared by Essmart product and catalogue development team, Sales Executives, shops, and end users include the following: cost and willingness to pay compared with other products in Essmart's catalogue, perceived quality (in the case of solar lanterns, the perceived strength of the light, which end users often erroneously determine to be directly correlated with the number of countable LEDs), actual quality (ranging from internal wiring to water resistance to durability), finishing, manufacturer's warranty and quality of servicing, availability in India (since Essmart cannot import large quantities), and margins that Essmart and its shops.

Suppliers need to know this information, since all of these concerns have the potential to inspire higher-quality, more usable, and more affordable products that more carefully meet the needs of end users.

Product and market testing for late-stage prototypes

In addition to testing commercially available products for inclusion in Essmart's catalogue, the company also offers a product and market testing service for designers with later-stage prototypes. Essmart's large shop network has huge potential to provide market-based feedback because it is the ideal setup for randomized controlled trials. The company can run experiments to test the effect of price, warranty-length, marketing interventions, packaging and bundling on retail sales. The testing periods and questions asked are co-designed by Essmart and the product designer.

Answers to these questions shape how the product is improved and marketed in rural India. Essmart's involvement in this later stage of product design is crucial to ensure that there is a market for these technologies when they are ready to be manufactured and commercialized at scale.

Establishing baselines for social impact technologies

Eventually, Essmart aims to establish standard guidelines for designing certain broad categories of social impact technologies like low-cost solar lanterns and improved biomass cooking stoves. These baselines will be based on the specific qualities, capabilities and price points that end users actually desire in a product.

For example, on one hand, current of commercially available solar lanterns possess features and designs that engineers believe end users will prefer and pay for. The design of these lanterns is based on a few conversations with a handful of end users in scattered geographers. On the other hand, Essmart collects market data on what end users actually prefer and pay for. If Essmart is capable of distilling what features end users desire in solar lanterns – and at which points they are willing to pay for these features – then the company will be able to extract baseline features for solar lanterns that will succeed in a commercial market. These baselines will guide engineers to design efficiently or iterate upon current and future solar lanterns. If engineers know that solar lanterns should at least achieve X level of brightness for Y hours at Z cost, then they can design around these specifications from the beginning of their product development process. Additionally, if designers know that end users are willing to pay for specific features on higher-end solar lantern models, then they can more confidently design models that are appropriate for different end user segments. This is a more nuanced understanding of value for money, since in many cases, cheaper is not always better. End users will pay for what they value, even if it increases the offering's overall price. As such, designers need to know what these valued features are.

As Essmart's catalogue widens and the company gains more experience marketing different types of products, it will be in the position to determine baseline design guidelines across multiple categories of social impact technologies and other products designed for penetrating the rural Indian market. Each product type will necessarily have its own baselines for user preferences and price points, and these baselines may be able to ensure that the products are desirable to at least Essmart's market. With such extensive collaboration and communication between technology end users and technology suppliers, Essmart can continue to directly connect end customer expectations with supplier capabilities.

Sharing information within the technology-for-development ecosystem

As a distributor of social impact technologies, Essmart is a literal middleman. The company considers every player in the ecosystem. This includes the engineers who develop new technologies, the shop owners who sell them, the end users who use or fail to use them, and the organizations who fund them.

Unfortunately, there is currently a severe disconnect between technologies designed for impact and the little

impact that they are actually making. The sharing of market-based information within the global technology-for-development ecosystem has immense potential to nurture collaborations that can spur the ecosystem forward. With more connections, economies of scale can improve, prices can decrease, and more players and social impact beneficiaries can enjoy the possibilities of a wider economic ecosystem. With an increase in overall output and scope, more desired products will enter the market and enable end users to make the best purchasing decisions for products and services.

Conclusion

The essential marketplace for bringing innovation to impact

Social impact technologies like solar lanterns and water filters have the potential to make tremendous impact at the bottom of the pyramid. However, the challenge presented by the technology-for-development ecosystem merely to invent these products must be called into question. Designers in this ecosystem must ask themselves: How can it be insured that my invention results in impact? Getting to this question is difficult given the current funding pipeline for social impact technology invention, which often fails to take into account the on-the-ground difficulties of implementation and distribution of technologies.

One of the biggest struggles encountered in the attempt to scale technology-for-development initiatives stems primarily from a huge multi-directional information gap. End users must be able to express their opinions about whether a product is good or bad, and they must be able to demand better products and services. Designers need to have the incentive to respond to end user demands and preferences. Funders need to invest in products that are actually able to sell. Everyone in the supply chain plays a critical role in creating and commercializing desirable, high quality, affordable technologies for development.

Essmart's marketplace plays an essential role in ensuring that invention results in tangible positive change. Within the framework of a marketplace, every player has a voice and is equally responsible for monitoring and assessment at multiple points throughout a product's innovation and to-market supply chain. This monitoring and assessment is only possible through the collection, analysis, and sharing of market research for social impact technologies.

Essmart's marketplace – essentially, infrastructure for distribution – exhibits great potential to be a platform by which information can be collected and shared throughout the ecosystem, addressing the existing distribution and information gaps in the technology-for-development space. If social impact technologies are going to reach more people through their market availability, then concrete efforts to improve the analytical process about the provision of these products must be undertaken. Through a more accountable approach that reflects and engages stakeholders at all levels of distribution and usage, social impact technologies will be iterated to better serve and empower end users and communities as intended.

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