WORK & VISION
Design that Matters (DtM), a non-profit based in Cambridge, Massachusetts, forms cooperative partnerships with organizations in developing countries to create world class products, enabling them to offer improved services and scale. A trail-blazer in creating designs for social impact, DtM has built a state-of-the-art open and collaborative design process through which hundreds of volunteer and reduced-rate collaborators in academia and industry donate their expertise and resources to the creation of breakthrough products for communities in need.

Our deep commitment to social impact compels us to partner with organizations that have extensive local community connections and proven ability to make and distribute solutions with systemic effects. Over the past decade, with the help of over 850 collaborators, DtM has transformed each of our partner organizations through the launch of products that improve the quality of life for beneficiaries in Africa and Asia, and has inspired countless others to do the same.
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The Design that Matters Team
By World Bank estimates, two-thirds of the world population lives on less than $2 per day. These communities lack access to such basic necessities as clean water, affordable health care and basic education. In order for these individuals to improve their quality of life—through productive work, community organization and political participation—they must receive more than direct charity and aid. The poor must be given the tools and opportunities to improve themselves, their families and their communities. This is the issue that social enterprise addresses in serving those at the “bottom of the pyramid.” Social entrepreneurs are change agents for the social sector. Social enterprises are usually more effective in addressing root causes than are supranational NGOs because they are better integrated into the societies they serve, and know the specific needs of their beneficiaries, but they lack access to well-matched design services that can help them improve their services and scale.

Designers are looking for ways to make a positive impact. A 2012 Designer’s Accord blog notes, “there has been an unprecedented surge of interest in the field of design for social impact, or as it has become known – social design. Designers are looking for ways in which to incorporate more meaningful social change work into their practices.” In this tight economy, companies are increasingly transforming into virtual organizations, creating a mass of self-employed contractors that are looking for meaningful work.

Affordability is the biggest obstacle between the design and social sectors; both affordability of design services and the cost of implementing the results. In an effort to make design services more affordable, many firms are offering smaller and smaller scopes of work, handing off virgin ideas that leave huge implementation gaps social enterprises do not know how to fill. In other cases, designers from the 1st world miss the mark by being over reliant on their own interpretations of impenetrable foreign markets creating an overemphasis on low-cost solutions in lieu of other critical user benefits, and leading to a lack of user adoption.

Design that Matters harnesses and empowers the top-tier, untapped, passionate talent in the design world to create real impact for poor communities in the developing world. DtM has a decade of experience figuring out which challenges in the developing world can be influenced by designs created through a collaboration of 1st world designers and 3rd world communities, and which challenges have a cost/benefit equation that just does not balance out. DtM’s world class designs are creating a ripple effect throughout the world.
OUR PROCESS: A CASE STUDY
Infant Phototherapy

Firefly
Design that Matters has a decade of experience crafting an original view on how to create breakthrough products that truly benefit people. DtM’s unique approach begins day one by forming a unifying project vision with carefully-selected implementation partners that have long-standing relationships with developing world communities in need. DtM has a fine-tuned affordable method to leverage student effort to generate, high-quality ideas. Our concepts are distinct from other failed solutions for the social sector because they genuinely emphasize user-centered design, of which affordability is only one part. DtM’s cutting edge open and collaborative process builds off the knowledge and experience of a wide array of experts who volunteer or reduce their rates to make breakthrough, multi-disciplinary designs. Once a concept has been chosen, DtM stands out from other firms in our commitment to drive the process all the way through implementation, transforming our partner social enterprises in the process, and creating a ripple effect of impact resonating throughout the world.

Project Firefly infant phototherapy is a great example of the unique qualities that make DtM stand out from the crowd of typical design firms, U.S. nonprofits, and international aid organizations. The following pages provide a detailed look at Project Firefly’s journey from partnership through impact.
“Mother care is better than nurse’s care because there are not enough nurses to cover all the infant care needs. The nurses can teach the mother how to check simple vital signs such as whether they are crying, if they are feeding and sleeping well, and if they seem too hot or too cold.”

Dr. Pham An Quang
Hai Duong Provincial Hospital
BEGINNING WITH A PARTNER AND A NEED

DtM does not attempt to be an expert in every culture and domain; rather, the experts are our partner social enterprises. We work closely with our partners through a series of on-site interviews and observations, to develop an understanding of their needs and the context in which they work. Based on these insights, DtM designs new products to make our partners more effective in delivering critical services to communities in need. Our partners are recognized leaders in their fields and credible representatives for their beneficiaries. They are also reliable distribution channels for the new products and services that result from our collaboration.

Building on DtM's experience in the design of newborn technologies for the poor, Design that Matters carefully selected East Meets West Foundation (EMW) and Vietnamese manufacturer MTTS as partners to develop a new infant care device that treats newborn jaundice during the critical first days of life. EMW has a successful 9-year-long Breath of Life newborn health program and extensive network of collaborators across Southeast Asia, and MTTS has expertise in the production and support of context-appropriate medical devices that currently serve 20,000 patients per year across 140 hospitals in Vietnam, Laos, Cambodia and East Timor, and soon expanding to India and the Philippines.

All DtM projects begin with a user need: a desire is not sufficient. Some 60% of normal newborns become clinically jaundiced sometime during the first week of life.¹ An estimated 10% of those effected will develop permanent, long-term disabilities or brain damage without treatment. It can take up to three days for an infant born with jaundice to travel from a rural area in Vietnam to a facility with phototherapy. Meanwhile, the infant’s condition worsens often beyond the hope of treatment. Rural district hospitals in Vietnam and Southeast Asia receive little training and are understaffed. There is often only one room for newborn treatment and one room for maternal recovery commonly located at distant ends of the hospital and sometimes separated by stairs. Based on these field research insights, DtM, EMW, and MTTS launched our new effort by writing what we call a “project point of view” summarizing the need Project Firefly will fill and specifying what is included, and not included, in the project scope.

¹ M. Maisels and A. McDonagh, "Phototherapy for Neonatal Jaundice," New England Journal of Medicine 358:9, 26Feb08

FIREFLY POINT OF VIEW

Low-resource hospitals in poor countries that provide overnight newborn care and wish to improve treatment outcomes for patients with severe jaundice, and reduce patient referrals for those with mild jaundice

- NEED -

an intuitive, robust tool that can be placed in the mother’s room to provide high-intensity, individual infant phototherapy to otherwise healthy newborns with mild to severe jaundice while allowing infant warming.
Innovation is a collaborative design process at Design that Matters in which teams of students and professional volunteers build on each other’s work in developing design concepts and prototypes. Iterations are evaluated by local faculty and domain experts, and tested in the field with partners and community members. For academic partners, like MIT, Stanford, and Rhode Island School of Design (RISD), DtM design challenges serve as curriculum materials in existing university courses, engaging students in real-world problems, while helping faculty to meet recent university accreditation requirements for experiential-learning courses. To date, we have completed dozens of DtM courses reaching hundreds students.

For Project Firefly, DtM initiated two student teams of MBAs, engineers, and industrial designers from Babson College and MIT/RISD who generated a wide array of ideas. To bridge the divide between Southeast Asia and New England, DtM provided inspirational, first-hand field research including photos, videos, and user feedback from our visits to Neonatal Intensive Care Units (NICUs) across India, Nepal, Bangladesh, Cambodia, Vietnam and Indonesia. To guide the team regarding technical and clinical feasibility, we coordinated local hospital visits at St. Elizabeth’s Medical Center, and periodic design reviews with expert clinical and technical professional volunteers from Brigham and Women’s Hospital and IDEO.

DtM’s project framing and field research inputs allowed the incredibly talented MIT/RISD Product Design and Development course students to create a desktop overhead light that directly inspired the Project Firefly final design.
“Laying next to Firefly, my eyes feel fine. I could even fall asleep right here. Using Firefly instead of the overhead phototherapy, I don’t have to worry where my baby is and I can lay comfortably and take care of him.”

Duo Thi Lu, Mother
Hai Duong Provincial Hospital
LISTENING IN THE HARDEST MARKET

Design that Matters emphasizes holistic, user-centered design over design for affordability. In designing for social impact, affordability tends to be the driving conversation. The social sector is flooded with solutions that are very low cost, but do not provide many other benefits, and are not well-adopted by users. DtM does not tackle challenges that rely heavily on local materials or village-level production techniques, as we believe 1st world designers do not bring enough value to the table for these projects. Instead, DtM targets partners with markets that can benefit from and afford high-tech, modern solutions that take advantage of modern manufacturing techniques and are better positioned to scale globally.

Based on our first-hand field research in six countries across Southeast Asia and close working relationships with experts in neonatology and global health at Harvard Medical School, Massachusetts General Hospital, and Brigham and Women’s Hospital, we found:

(1) **Severe jaundice is more common in poor countries, particularly in referral facilities.**
   - In the clinical trial, 64% of patients were considered “high risk” for developing hyperbilirubinemia.
   - Firefly has demonstrated the ability to treat these severe jaundice patients who might otherwise require expensive and risky exchange transfusions under conventional overhead phototherapy.

(2) **Providing effective phototherapy in primary care facilities will reduce patient referrals and incidence of severe jaundice.**
   - In the clinical trial, 94% of the newborns entering therapy at Moc Chau District Hospital were considered “low risk” for developing hyperbilirubinemia.
   - Firefly’s user-friendly design is intended to encourage jaundice treatment in primary care facilities like Moc Chau. Without Firefly, these same low-risk patients would develop severe jaundice in transit to a phototherapy-equipped referral hospital.

For Project Firefly, a high-tech, trusted medical device aesthetic was a key component in user acceptance. The direct cost of the device is born by hospitals, governments, or donors, so affordability was defined as a combination of user-friendly features at a lower cost than U.S. overhead LED phototherapy.

DtM collected initial concept feedback from East Meets West Foundation, Vietnamese manufacturer MTTS, and 88 doctors at EMW’s Central Vietnam Jaundice Conference. This informed the development of a to-scale looks-like prototype, that DtM took to 7 district, provincial, and national hospitals in Vietnam for feedback from directors, doctors, nurses, and parents to fuel the next stage of concept refinement.
Working with top experts in open source intellectual property (IP) from Choate, Hall, and Stewart, LLP, DtM has developed a process to leverage the skills and intellectual capital of hundreds of volunteers and reduced-rate collaborators in academia and industry to create breakthrough solutions for communities in need. With three full-time staff, and more than 850 academic and professional volunteer and reduced-rate collaborators, Design that Matters has created over a dozen product concepts since its inception, two of which have reached implementation in the developing world. Sitting at the seat of world-class innovation in Cambridge Massachusetts near MIT and Harvard, DtM’s agile and responsive network spans top experts in the professional and academic world across design, engineering, manufacturing, ethnography, law, and business, allowing us to tackle the world’s toughest challenges more quickly and with greater resonating impact.

In only 5 months, using our open and collaborative process and state-of-the-art project management techniques for remote teams, DtM brought on 8 reduced-rate engineering collaborators from 5 firms: Lincoln Design Solutions, Boston Design Solutions, Excellus Engineering, Optics for Hire, and Actinica, to refine the Project Firefly concept into a device ready for clinical trials. DtM’s full-time staff refined the industrial design based on user feedback and selected manufacturing processes, then the extended technical team created a breakthrough, completely sealed, tilted base with external heat sink to (1) prevent overheating the infant bed in hot climates, (2) protect against ingress of insects and dust, and (3) eliminate breakage due to moving components like fans. To fill the infant bed with uniform intense light, the top lamp includes a clever, tilted LED layout with off-the-shelf lenses that fits inside a low-cost aluminum extrusion.

Only one test engineering prototype was needed for our team of advisors from IDEO, Bose, Cooper Perkins, MIT, and Brigham and Women’s Hospital to give it the seal of approval. The design for clinical trial fit together like a hand to a glove. Mike Damiano, Director of Boston Design Solutions remarks, “DtM is truly a high-performance team and I think Project Firefly is an outstanding case study for project management at a virtual company. Virtual Projects don’t usually go this well - it’s not normal. Everything just fit together in such a short amount of time; both the team and the product.”

PUNCHING WELL ABOVE OUR WEIGHT
“The overhead phototherapy systems are tall, so you can’t clean on top of them or even see if they are dirty. Bugs can get inside the overhead units. Firefly is very small and easy to clean.”

Dr. Nguyen Thanh Ha, Director
National OBGYN Hospital
Commitment to Implement

At a time when many firms are making design services affordable to the social sector by handing off ideas at earlier and earlier stages, Design that Matters has found innovative ways to shepherd our designs from start to finish and transform the organizations we work with for the best chance of reaching impact. In the field of international development, DtM realizes the design of a compelling, high-impact solution is only one small part of the incredible ecosystem of steps that must be taken to implement a design in these erratic, nascent markets. Every DtM design is inspired by ongoing partner input about the changing landscape of regulations; marketing; training; manufacturing and assembly; transport and delivery; and service and maintenance. Once a project reaches the concept development phase, DtM is committed to working with our partners to overcome obstacles that stand in the way of positive impact. We have responded to the social sector’s boot-strapped, opportunistic outlook by evolving a shared risk and reward project model customized to each partnership and phase including a combination of partner fees, joint fund-raising, and direct DtM subsidy to make our services affordable. DtM’s high-tech modern designs with free and fluid intellectual property maximize the potential for additional implementation pathways with impact far beyond our initial target communities. This very different and powerful way in which DtM engages in design continues to yield world-class products that have attracted organizations with distribution channels in the developing and developed world alike, leading to impact on a global scale.

In our commitment to implement Project Firefly, DtM made multiple adjustments to the design to suit East Meets West Foundation’s mix of stakeholders, MTTS’ manufacturing capabilities, and position the design for global scaling within and beyond our initial partnership. The current Firefly design is geared to an assortment of low-volume processes, techniques, and off-the-shelf parts, some of which are familiar, others which expand the capabilities and impact potential of Vietnamese manufacturer MTTS. On multiple occasions, DtM visited a selection of MTTS’ current Vietnamese vendors and MTTS visited DtM’s low volume manufacturing contacts in Boston to come to an agreement on the best processes for Project Firefly. The solution cleverly straddles the worlds of high-volume and low-volume production; designed for low-volume with an ability to be converted with minimal effort to high-volume processes for more global impact. The resulting modern, medical design knocked the socks off DtM partners East Meets West Foundation and MTTS, and has already attracted the attention of other infant care companies with global distribution in the U.S., Canada, and the developing world.
"Firefly provides very good access to the infant for bottle feeding, diaper changes, and even blood tests. We performed blood tests on each of the four infants treated so far without removing them from Firefly."

**Dr. Nguyen Thanh Ha, Director**
National OBGYN Hospital
A WORLD CLASS RESULT

During the 2011 Firefly clinical trial at National OBGYN Hanoi, DtM verified that we have created the world’s most effective phototherapy device for hospitals in the developing world.

OUR RESULTS TO DATE INCLUDE:

85 Infants have been treated, including 3 treated in Mom’s bed¹
With 2 Firefly clinical trial devices²
at 2 Referral Hospitals³ & 1 District Hospitals⁴

In one study, Firefly showed a 40% reduction in treatment time⁵
and has averted 3+ exchange transfusions⁶

Learnings from the clinical trial have opened up new pathways for Firefly beyond our initial focus on rural hospitals including high-level hospitals with need of intensive treatment for severe cases, hospitals with large patient loads in need of faster treatment, any hospital or clinic with a large number of staff using the same device, hospitals with little space for larger devices, and even medical treatment for the U.S. and Canada.

Firefly has already inspired worldwide interest resulting in purchase requests from organizations servicing Mexico, Uganda, Nigeria, Ghana, Malawi, Tanzania, the Middle East, Canada, and Europe.

¹ Over 287 treatment days. In use from December 8, 2011 through January 6, 2012 & April 26 through September 10, 2012.
² Out of three beta Firefly units total manufactured in December 2011
³ Referral Hospitals include National OBGYN Hospital & St Paul General Hospital
⁴ Moc Chau District Hospital
⁵ Firefly data from 17 infant treatments with average initial TSB 305 μMol/L (17.8 mg/dL) yielded median serum bilirubin reduction rate of -6.7 μMol/L/hr (-0.39 mg/dL/hr). Multiple linear regression of Firefly data based on study of 66 infants in 2-sided phototherapy predicts Firefly rate of -5.3 μMol/L/hr (-0.31 mg/dL/hr) given initial TSB of 265 μMol/L (15.5 mg/dL) (Maisels, M.J., et al., Randomized controlled trial of light-emitting diode phototherapy. Journal of Perinatology, 2007. 27(9): p. 565-7). Single-sided LED phototherapy average total serum bilirubin reduction rate of -3.0 μMol/L/hr (-0.18 mg/dL/hr) determined from 5 randomized control trials with 262 patients undergoing LED phototherapy and 280 patients undergoing Fluorescent or Halogen phototherapy, average initial TSB of 275 μMol/L (Seidman 2000, Seidman 2003, Martins 2007, Bertini 2008, Kumar 2010).
⁶ An expensive, high-risk treatment of last resort for patients with severe jaundice, where all the newborns blood is removed and replaced by donor blood.
"We feel Firefly is easier to use than overhead phototherapy because we can put a blanket on top of the baby and still provide effective phototherapy from the bottom. Overhead phototherapy could be set at the wrong distance from the infant bed and it's more cumbersome to use."

**Dr. Tran Van Thuan**

Hai Duong Provincial Hospital
DOCTOR, NURSE, AND PARENT FEEDBACK ON FIREFLY

Clinically Effective:

"During this pilot study, we have highly appreciated the efficiency of Firefly. It is our most efficient phototherapy, so we give priority to infants with the most severe jaundice."
- Dang Van Tai, Head Nurse, Moc Chau District Hospital

"I am most impressed with how fast the bilirubin level is reduced. I save Firefly for the most severe cases. We moved this baby from overhead phototherapy to Firefly when his levels spiked to 405. If we hadn't had Firefly, we would have had to do an exchange transfusion."
- Nurse Dan Thi Quynh, St Paul General Hospital

Trustworthy:

"Firefly is very easy to use because you don’t have to adjust the height, anyone can use it—nurses, mothers and midwives."
- Dr. Ngo Min Chuong, Director, Nam Dihn Obstetric Hospital

Resource Effective:

"If the price of an overhead phototherapy was 20M VND, then I would expect Firefly would be about 30M VND because it is so much more effective and it also prevents cross infection."
- Dan Thuy Quynh, Nurse, St. Paul General Hospital

Durable:

"With fluorescent overhead phototherapy, we will be in the middle of a treatment and then suddenly we’ll need to change the bulbs. It’s very inconvenient. With Firefly this is not the case."
- Dr. Nguyen Ngoc Loi, NICU Director, National OBGYN Hospital

In Mom’s Room:

"I like Firefly because I can lay next to my baby, and always be with him. Before I wasn’t able to be with my baby, and I worried if he was ok."
- Nguyen Thu Tuyet, Mother, Da Nang Hospital for Women & Children

"Putting Firefly in the mother’s room will actually be more convenient for the staff because the mothers will watch the babies and just call the nurse if something is needed. It’s very obvious that putting baby with the mom creates a better relationship between the two."
- Dr. Nguyen Ngoc Loi, NICU Director, National OBGYN Hospital

"We have been using phototherapy in mom’s room for 5 years. Overhead phototherapy in mom’s room is not ideal since the height is often set incorrectly, Firefly solves this problem."
- Dr. Truong Thi Nhu Huyen, Da Nang Hospital for Women & Children

"This is very suitable for Vietnam because of the psychology of Vietnamese mothers—they want their baby beside them. It makes for a friendly hospital environment."
- Dr. Bui Van Chan, Vice Director, Hai Duong Pediatric Hospital
OUR ADDITIONAL PROJECTS
One in five adults worldwide does not know how to read. In rural regions of West Africa, up to 75% of the population is illiterate. Literacy provides a solid foundation for poverty reduction and improves lives in very practical ways: enabling mothers to read expiration dates on medicine bottles; assisting farmers with reading application instructions on chemical packaging; and increasing the likelihood that women participate in the political process.

According to World Education, “It’s the lack of resources;”—specifically access to books and lighting—rather than a lack of interest in education that contributes to illiteracy rates. Since most adults work during the day, the majority of World Education’s students in Mali take classes at night. Residents of these rural communities lack access to electricity and, therefore, electric lighting.

**NEED**

- Working adults in rural communities without electricity

  - NEED -

  robust, easy-to-use tools to help them learn during nighttime literacy classes.
To answer the challenge, Design that Matters partnered with World Education, founded in 1951, with educational programs tailored to local context and need implemented across 50 countries including Mali. The design process began with multiple rounds of fieldwork hosted by World Education in classrooms in Mali to observe conditions and gather feedback about device prototypes. DtM found:

[1] Each student had maybe fifteen minutes to learn during a two-hour class—the amount of time the classroom’s single kerosene lantern was close to their desk.

[2] Books disintegrate quickly in both the arid and subtropical climates in Mali, it is a logistical challenge to provide one copy for each student, and material selection is limited.

[3] To learn to write, the students depend heavily on the teacher who may have poor handwriting.

Through DtM’s collaborative design process, engineering and business students at MIT, Worcester Polytechnic, Babson College and Cambridge University in the UK in conjunction with industry volunteers, collaborated in the design of a learning tool. Later stages of the work leveraged industry experience from product design professionals as well as a unique optical design made affordable by donation from Fisher-Price and Optikos designer Dr. Steve Fantone.
INNOVATION

Tackling the need for both lighting and reading materials, the Kinkajou Microfilm Projector is a rugged, lightweight, low-power projection system, which uses a microfilm cassette to store up to 10,000 images at a fraction of the cost of paper books. The system also employs state-of-the-art LED lighting and low-cost plastic optics adapted from "View Master" toys to project an image large enough for the entire classroom to read. The design requires no tools more complicated than pocket change for maintenance, and includes a battery, charge controller and solar panel for off-grid use.

In 2004, with funding from USAID, World Education implemented Kinkajou Projectors in literacy centers in 45 Malian villages. After two years of use, over 3,000 adults have learned to read using these projectors. The results of an independent, two-year pedagogical impact study, completed in Mali with World Education in 2005, shows that performance in Kinkajou nighttime classes far exceeds that of non-Kinkajou nighttime classes, and even exceeds the performance of World Education’s daytime adult literacy classes.

"It is better, because without [the Kinkajou], when the teacher is writing on the board, students wait in the dark in vain, and they do nothing. We lose much time and the quality of handwriting is not good."

Literacy teacher ("karamogo") Martine Sogoba in Digani, Mali

Of the four million babies worldwide who die in the first month of life, one million die on their first day. Pre-term birth is attributed, either directly or indirectly, to at least 25 percent of neonatal deaths. About half of the worldwide total, or 1.8 million babies each year, die for lack of a consistent heat source before they have the body fat and metabolic rate to stay warm independently.

Despite the benefits and need for this equipment, incubators are not available in most poor countries. In addition, kangaroo care - regulating infant body temperature with the mother’s body heat through skin-to-skin contact - is often culturally taboo or not feasible due to a mother’s other responsibilities, illness, or death. Conventional incubators designed for industrialized markets can cost up to US$30K, and when donated, are not able to be understood or maintained. According to a Duke University study, up to 98% of donated medical equipment in developing countries is broken within five years. Appropriately-designed incubators could help provide millions of at-risk infants with shorter hospital stays and can enable infants who might otherwise have faced a lifetime of severe disability to experience full and active lives.

To create a solution, DtM melded medical best-practices and design for low-resource settings. Based on direct observations of and input from a wide range of stakeholders in rural clinics and hospitals across India, Bangladesh, Nepal, Vietnam, Cambodia, Indonesia, and the U.S., DtM found:

1. Spare parts are difficult to locate in rural settings, forcing medical staff to forgo regular maintenance. In Nepal, DtM encountered 6-month air filters that had not been changed in 5 years, and a US$0.60 fuse that could only be sourced during semi-annual trips to a larger city.

2. Intermittent power leaves devices unusable during parts of the day and voltage spikes destroy sensitive equipment. Parts associated with the power supply were the most common incubator repair need DtM encountered.

3. Infants are at risk of hypothermia beginning immediately after birth, but current incubators are not transportable between a rural home birth and clinic, or even a hospital delivery room and Neonatal Intensive Care Unit (NICU), especially when separated by stairs.

In response to these needs, DtM collaborated with Medicine Mondiale in New Zealand and the Center for the Integration of Medicine and Innovative Technologies (CIMIT) in Boston, Children’s Hospital in Boston, the Harvard Medical School, the Stanford Medical School and many Boston NICUs, as well as a huge crowd of talented students, professional volunteers, and domain experts. NeoNurture is part of Design that Matters’ Newborn Technology Development program, created in response to the need for better tools to address infant morbidity and mortality in the developing world.
NeoNurture takes advantage of an abundant local resource in developing countries: car parts. The incubator leverages the existing supply chain of the auto industry and the technical understanding of local car mechanics. Among other components, it uses sealed-beam headlights as a heating element, a dashboard fan for convective heat circulation, signal lights and a door chime serve as alarms, and a motorcycle battery and car cigarette lighter provide backup power during incubator transport and power outages.

NeoNurture is composed of two distinct parts: the bassinet and the base. The base includes rugged wheels and a storage space for necessary replacement parts. The bassinet has four-sided hand holds and is detachable for transport; can be angled on the base to prevent infant acid reflux; and opens to allow three-sided access for complex procedures or one-sided access to maintain warmth during routine tasks.

DtM’s NeoNurture has fired the imagination of people across the globe through inclusion in multiple exhibits and publications worldwide. Most notably, NeoNurture was listed as #1 in Time Magazine’s 2010 issue, “The 50 Best Inventions of the Year”, was featured on ABC News and CNN, received an honorable mention in ID Magazine’s 2010 Annual Design Review, and was part of the 2010 Cooper Hewitt Design Triennial.
PROJECT POINT OF VIEW

Children with mild to severe hearing loss in families earning less than $5/day

- NEED -

a child-friendly hearing aid that is less expensive, robust, rechargeable, desirable, and allows untrained audiologists with only simple tools to fit and adapt it to a range of hearing impairment levels.
278 million people worldwide have moderate to profound hearing loss in both ears and 80% of those people live in low- and middle-income countries according to 2005 estimates by the World Health Organization (WHO). The longer a child waits to receive a hearing aid, the more the brain and auditory nerves atrophy, making it a one-way trip into permanent hearing impairment that can never be corrected or even compensated for with any technology. The situation is especially critical for children whose hearing impairment begins before the age when speech normally develops.¹ The cost of disposable batteries and the need to constantly refit children due to rapidly changing ear size make current hearing aid systems unaffordable. In addition, children often do not want to wear hearing aids because they are not rugged enough for use during normal children’s activities and they mark the children clearly as having hearing loss.

To create a much-needed solution to this challenge, Design that Matters partnered with Solar Ear, the creator, manufacturer, and distributor of the first digital rechargeable hearing aid, solar battery charger, and rechargeable hearing aid batteries at an affordable US$100 price for adults across 30 countries in the developing world. DtM then assembled a top-notch team of collaborators including the MIT and Rhode Island School of Design Product Design and Development course, Andrew McGrath - Director of Audiology at Rhode Island’s Women & Infants Hospital, and experts from hearing impaired communities across Brazil, Vietnam, India, and Gallaudet University in DR Congo.

The result transforms Solar Ear’s current in-ear hearing aid into a miniature walkman-like concept that clips onto a child’s shirt, enabling additional space for use of larger, cheaper, and more ubiquitous AAA batteries. A kid-friendly, interchangeable, washable, personalizeable cover, and a breakthrough pictoral user’s manual particularly impressed Solar Ear. We are currently planning the next phase of design for this much-needed intervention.

Flow Controller

IV Drip

PROJECT POINT OF VIEW

Untrained health care providers in hospitals, rural clinics, and temporary medical facilities across the developing world

- NEED -

a more user-friendly and intuitive means to control IV flow rate and reduce errors in drug delivery.
NEED, APPROACH, AND INNOVATION

In the hospitals of wealthy countries, bedside care is managed by trained medical staff, and intravenous drug delivery is managed using a computer-controlled pump. In the developing world, nurses and pumps are typically replaced by family members who are unlikely to have medical training and who may even be illiterate and are left to control IV flow for their loved ones. The standard IV clamp has a nonlinear relationship between clamp position and IV flow rate making it non-intuitive. It takes practice to achieve accurate flow rate settings, and errors can be deadly.

In May 2005, three patents were issued to MIT on the work performed by Design that Matters (DtM) in the area of improved IV drip flow monitoring and control. By making a simple change to the clamping surface of the current manual device, DtM created an IV drip flow controller with a linear relationship between the clamp position and the output flow rate. This allows users to set flow rates more intuitively and with repeatable results, improving accuracy and reducing errors.

In August 2005, DtM launched a collaboration with New Zealand-based NGO Medicine Mondiale to determine the key clinical design inputs for an improved IV flow controller. This included funding clinical surveys in the United States, Bangladesh, Eritrea, Kenya, and Nepal. These surveys confirmed that an improved IV flow controller can profoundly enhance medical treatment regimens in poor countries. Based on these insights, Medicine Mondiale created the Acuset IV flow controller. The Acuset controller completed clinical trials in 2007, and volume production began in 2008 when it also received honors as a finalist in the Saatchi & Saatchi World Changing Ideas Awards and winner of the Bayer Innovators Award. Medicine Mondiale’s simple and cheap Acuset controller is a breakthrough in health equipment that has implications for treatment for millions of people throughout the developing world.
Newborn Respiratory Therapy

CPAP

PROJECT POINT OF VIEW

Premature and low-birth-weight infants treated in national-level hospitals in the developing world

- NEED -

an affordable, robust, maintainable, intuitive technology that works with compressed oxygen to alleviate respiratory distress for the first several days of life.
Hundreds of thousands of newborns die every year in developing countries because they can’t get enough air into their lungs, a condition known as respiratory distress. Premature infants lack surfactant in their lungs, a soap-like coating that prevents the interior of the alveoli from sticking together. Without a Continuous Positive Airway Pressure (CPAP) machine, an estimated 30% of the newborns with respiratory distress will suffocate.

In 2009, Design that Matters’ Newborn Technology Development program expanded to include a CPAP concept device to alleviate respiratory distress in premature and low-birth-weight infants. During extensive prior research across Neonatal Intensive Care Units (NICUs) in Southeast Asia for the NeoNurture project, DtM found:

1. Cost of ownership with current CPAPs is too high, given that the typical device is designed to use US $200 worth of disposable tubing and heating elements for each patient.

2. Most western CPAPs do not include hardware to mate with bottled oxygen, the most common form of oxygen supply in the developing world.

3. Doctors did not adjust oxygen supply using the US $2000 oxygen/air-mixer; the most expensive part of the CPAP. Instead, they switched between 100% room air and 100% oxygen for simplicity.

4. Many CPAP user interfaces, including malfunction indicators, are located below the waist. These interfaces are largely ignored by busy clinicians overburdened by mounting patient loads.

To craft a solution, DtM engaged a team of students from MIT and the Rhode Island School of Design as well as experts in neonatal medicine, engineering, and medical device design from Brigham and Women’s Hospital and Phillips Healthcare. The result is a less expensive CPAP device comprised of four primary components: a $5 Venturi oxygen/air mixer, heater and humidifier, releasing, and monitoring. The Infant CPAP won the 2009 HSBC RISD International Award for, “demonstrating innovative thinking, potential for success and making a positive international impact.”
THE DTM RIPPLE EFFECT
Raising Design Awareness in the Social Sector

Design for Impact Labs
Social entrepreneurs are mission-driven, determined to achieve results and committed to maintaining accountability to the communities they serve. According to Ashoka founder Bill Drayton: “An entrepreneur plows the field” and “weakens the idea that change isn’t possible.” Social entrepreneurs effect systemic transformation by tackling not only the problem at hand, but also the roots of that problem.

Design solutions and design thinking can have a profound effect on social enterprise, taking them to the next level of impact and scalability, but most members of the social sector have only a shallow awareness of what design has to offer. Design services are often perceived as unaffordable not only because of the cost, but the cost in comparison to the perceived benefit. It can be difficult for designers based in the 1st world to intersect and make the kind of meaningful connections with international social enterprise that lead to deeper partnerships. Design can have an explosive impact on the social sector, and similarly, the social sector can have a transformative effect on the world of design, if only they are in the same room together.

**NEED**

Social enterprises who are interested in innovation, but have little experience with design services

- **NEED** -

small-scale opportunities to engage in design thinking to raise awareness of its value throughout the social sector and plant the seeds for new partnerships.
Design for Impact Labs are a chance for social enterprises to get valuable advice from Design that Matters’ (DtM) core team and network of experts in design thinking methodologies. Over the course of several hours, DtM uses a teachable design process to collaboratively generate suggestions and ideas that social enterprises can immediately implement. Each lab has three stages: preparation, lab, and follow-up. During preparation, DtM staff works with the social entrepreneurs to craft one to three focused questions to be addressed during the lab. Then an appropriate lab team is formed from DtM’s network and members of the social enterprise to tackle the question. During the lab, DtM volunteers are inspired by social enterprise’s mission and background. After agreeing on the final question, and the techniques used to address each question, the team shifts into generating mode. After the lab, DtM sends a packet of materials to all participants with a record of what was generated, a reminder of the processes used, and additional design references. Long after the lab, DtM stays in close touch to determine whether the lab benefited the social enterprise and to nurture good matches into full partnerships.

Example Topic Areas Include:
- Conducting user research: suggested interview, observation, and information synthesis techniques that help guide the creation of solutions geared for user-adoption.
- Generating ideas: brainstorming together to think of solutions on a chosen topic, abstract or concrete.
- Testing concepts: discussing how to use rapid prototyping to test for usability and technical feasibility.
- Detailed engineering problem-solving: bring a tough engineering challenge and have a discussion or brainstorm about new angles of attack.
- Design review: suggesting areas for product or service improvement from a business, technical, or user standpoint.
Since the initiative’s inception in 2010, Design for Impact Labs have had an immediate effect on all ten organizations who report integrating the techniques they learned and implementing some of the ideas we generated together. To date, connections made during the labs have led to follow-on conversations between DtM and over half of the social enterprises including generation of a children’s hearing aid concept in 2011 with Solar Ear. Examples of lab questions and feedback appear below.

How might we manage risk throughout the twists and turns of a unique global collaboration?

“T’m grateful to have had the opportunity to meet with you all; not only did it really help frame/re-frame Kiva.org + Water.org ideas and scenarios, it also helped me think about applying this process to a wider set of things in both my professional and personal life. Again, thanks!”

April Rinne, Director of WaterCredit, Water.org

What infant care technologies would be appropriate for ASHAs in India to sell or rent to rural homes to improve infant mortality?

“The methodology used was very inter-active and made me feel at ease even though I am not from a technology or an engineering background. The group of facilitators had diverse skill sets which helped in coming up with innovative ideas to address the problem that was being discussed.”

Sita Shankar Wunnava, Director, Maternal and Child Health/Nutrition, PATH India

How might we make simple changes to improve the usability of the solar suitcase?

“I really loved working with you, and it inspired us to continue brainstorming at home [see photo of me in my kitchen yesterday]. We have incorporated design changes that were very much influenced by the session with you. Needless to say, you took us a great deal forward.”

Laura Stachel, Founder, WE CARE Solar, makers of a solar suitcase to power medical lighting and communication
Collaborate and Educate

Driving Design Conversation
The DtM project experience is, for many individuals and organizations, their first exposure to problems faced by people in poor communities. DtM alumni are embracing their role as citizens of the world, and many have realigned their life or corporate trajectories to focus on the social sector.

Inspiring individual career trajectories

“Design that Matters was a real inspiration at a pivotal point in my career. The class topics, readings, and the proffered resources, inspired me to work on projects that I truly cared about, through which I could see a concrete deliverable, with meaningful impact on a tangible community. [...]”

Rebeca Hwang, Chemical Engineering, MIT, 2001 DtM IV Flow Controller project participant, Stanford PhD, “Social Networks and Water Provision to the Poor”

Inspiring organizations to adapt their missions

“I started volunteering with DtM in 2004 along with a couple of IDEO colleagues. Others at IDEO were curious about our experiences and wanted to be involved. Over the course of multiple years I helped DtM collaborate with over 100 people at IDEO to benefit DtM’s learning tools and infant incubator projects. I believe the experience with DtM was one of the leading factors influencing IDEO to seek out more projects with positive social impact and was a key contributor in fueling internal dialog about the impact of all projects at IDEO.”

Elizabeth Johansen, former IDEO Project Lead, 2007 DtM infant incubator project participant, Director of Product Development at DtM since 2010

Inspiring creation of new organizations

“When I came to Stanford to get my PhD in electrical engineering, I never thought that I’d find myself running a company making infant warmers. The opportunity offered by DtM through it’s collaboration with Extreme Affordability at Stanford, helping students use design thinking to solve some of the biggest challenges in the world, changed the choices I made about my path. Embrace owes DtM for early inspiration in taking on our mission.”

Rahul Panicker, Co-Founder and Chief Operating Officer, Embrace Global, 2007 Stanford Extreme Affordability + DtM infant incubator project participant

The Embrace infant warmer is a low-cost device resembling a sleeping bag which uses a phase-change wax to keep an infant at a constant temperature for up to 4 hours. In December 2010, Embrace Global announced a global partnership with GE Healthcare.
Design that Matters (DtM) inspires designers to integrate positive social impact into their schools, companies, and lives. Since its inception as an MIT Media Lab class in 2001, DtM has made a point to share its original insights, design processes, and results through many avenues, and has engaged over 850 collaborators across academia and industry in creating breakthrough products for communities in need. Through a commitment to openness, volunteerism, and education, DtM has inspired a ripple effect within the design community to help create a better quality of life for the poor in the developing world.

Education about design’s potential for social impact is an integral part of DtM’s mission. DtM maintains open partner relationships that allow us to share field insights, process, and designs as they happen. Our philosophy is to maximize the positive effect of design on poor communities by making a direct impact and then inspiring other individuals and organizations to do the same. Through the engagement of volunteers and professionals in our collaborative design process; hundreds of speaking engagements, seminars, and design workshops; academic and mass-media publications; and awards, DtM has profoundly influenced the conversation about design’s role in social enterprise and global change.
AWARDS & PRESS

DESIGN AWARDS

Cooper Hewitt National Design Award / Winner
2012/ New York, NY

International Design Excellence Awards / Silver
Social Impact Design
Project: Firefly
2012/ San Francisco, CA

International Design Excellence Awards / Finalist
Medical & Scientific Products
Project: Firefly
2012/ San Francisco, CA

Spark: Pro / Spark! Award
Project: Firefly
2012/ San Francisco, CA

Spark: Concept / Gold
Project: Firefly
2011/ San Francisco, CA

Cooper Hewitt National Design Award / Finalist
2011/ New York, NY

Time Magazine/ Number 1 of Top 50 Inventions of 2010
Project: NeoNurture
2010 / New York, NY

COOPER HEWITT NATIONAL DESIGN AWARD / WINNER
2012 / NEW YORK, NY

INTERNATIONAL DESIGN EXCELLENCE AWARDS / SILVER
SOCIAL IMPACT DESIGN
PROJECT: FIREFLY
2012 / SAN FRANCISCO, CA

INTERNATIONAL DESIGN EXCELLENCE AWARDS / FINALIST
MEDICAL & SCIENTIFIC PRODUCTS
PROJECT: FIREFLY
2012 / SAN FRANCISCO, CA

SPARK: PRO / SPARK! AWARD
PROJECT: FIREFLY
2012 / SAN FRANCISCO, CA

SPARK: CONCEPT / GOLD
PROJECT: FIREFLY
2011 / SAN FRANCISCO, CA

COOPER HEWITT NATIONAL DESIGN AWARD / FINALIST
2011 / NEW YORK, NY

TIME MAGAZINE/ NUMBER 1 OF TOP 50 INVENTIONS OF 2010
PROJECT: NEO NURTURE
2010 / NEW YORK, NY

COOPER HEWITT NATIONAL DESIGN AWARD / FINALIST
2010 / NEW YORK, NY

I.D. MAGAZINE ANNUAL DESIGN REVIEW / HONORABLE MENTION
PROJECT: NEO NURTURE
2010 / NEW YORK, NY

THE TECH MUSEUM AWARD
2005 / SAN JOSE, CA

SOCIAL ENTREPRENEURSHIP AWARDS

World Technology Network Social Entrepreneur 2009
DITM CEO Timothy Prestero was selected by his peers for doing innovative work of "the greatest likely long-term significance."

Social Venture Network Award 2007
Innovation, selected through the "Imagine What's Next: Ideas that Will Change the Way the World Does Business" contest.

Third Goal Service Award 2006 / Boston Area
For returned Peace Corps volunteers. For fostering mutual understanding among all peoples through outstanding community service.

Draper Richards Fellow 2004
By delivering support at the critical start-up phase, Draper Richards Fellowships help outstanding people create wide-reaching social change.

Ashoka Affiliate 2004
Ashoka invests in social entrepreneurs. Founded in 1982, Ashoka has elected over 1,400 Ashoka Fellows in 48 countries in such fields as health, education and the environment.

Martin Fellowship / MIT Laboratory for Energy and the Environment
2003
In recognition of efforts toward global sustainability.

PRESS

ABC News
AOL
Ashoka
BBC
Bloomberg Businessweek
Christian Science Monitor
CNBC
CNN
CNET
Colab Radio
Core77
Fast Company
Forbes
Gizmodo
Harvard Gazette
Holland Herald
IDSA
IDSA Innovations
India Today
Mandate
Mass High Tech
Metropolis
MIT News
Next Billion
NPR
Project H
Radio New Zealand
RISD XYZ
Scientific American
Smithsonian TV
Solidworks World 2011
Taproot
TED.com
TEDxCambridge
The Hindu
The New York Times
The Wall Street Journal
Yanko Design

EXHIBITS

Design Triennial / Cooper-Hewitt National Design Museum
2010 / New York

Design for the Other 90% / Cooper-Hewitt National Design Museum
2007 / New York

Substance: Diverse Practices from the Periphery / Metro State Center for Visual Art
2007 / Denver

Current Science and Technology / Museum of Science
2003 / Cambridge
Elizabeth Johansen, Director of Product Development

Elizabeth guides DtM’s process creating new products and services for the poor in developing countries. Using her engineering experience and design thinking background, she leads an array of resources for DtM including students, professional volunteers, and contractors to create designs with positive impact.

Prior to DtM, Elizabeth worked at IDEO for 8 years as a design engineer and project lead. Her experience spans strategy to design for manufacturing and has led to three U.S. patents and two patents pending. Past clients included Becton Dickinson, BriteSmile, Alcon, 3Com, and JP Morgan, with product launches of the Eli Lilly Kiwkpen and HumatroPen HGH and the Target itso modular storage system. Elizabeth’s passion for design for positive social impact has led her to facilitate many design thinking workshops and engage in multiple speaking engagements across academic and professional venues.

Will Harris IDSA, Designer

Will is a graduate of the Rhode Island School of Design, where he received a BFA in Industrial Design. Before joining Design that Matters, Will ran a freelance design consultancy working with clients in the medical, consumer goods, and furniture industries. He has also worked with multiple start ups, assisting with business development, design management, and company branding. Will is a member of the Industrial Designers Society of America and a 2012 Starting Bloc Fellow.