Philanthropy by Design

Promoting social empowerment through knowledge sharing, creativity and co-design
Abstract
Through what is known as strategic philanthropy, many companies are offering their expertise or products for free to help tackle specific social and environmental issues in underserved communities around the world. Philips Design has a dedicated initiative, called Philanthropy by Design, for developing meaningful and sustainable solutions for the more fragile categories of the global population. In this book we explain the details of this initiative, and also look at three specific examples of how it is being applied.

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A platform for our humanitarian and social commitment

Introduction
Rather than giving money to worthy causes, an increasing number of companies are choosing to help communities by donating their products or expertise to special projects which target local communities or specific segments of the population. Known as ‘strategic philanthropy’, this approach is driven by the desire to combine social responsibility commitments while supporting the company’s objectives to fulfil the brand promise, strengthen employee engagement, increase trust and reinforce customer loyalty. In many cases, it leads to the development of new ways of working and innovative solutions relevant to the business values and key competencies.
Philanthropy by Design

Philips Design is a firm believer in this strategic philanthropy approach. In fact, we have been working on a program, known as Philanthropy by Design, since 2005. This program aims to create and deploy humanitarian propositions which address social and environmental issues affecting the more fragile categories of our societies.

Leveraging Philips Design’s creative expertise and socio-cultural knowledge, the program channels design talent to develop meaningful and sustainable solutions that can contribute to a better future for all. It also opens up new perspectives in co-creating value through cooperation with ‘unconventional’ partners such as aid organizations, public bodies and social players who offer complementary expertise and values.

Solutions that empower and relieve

The ambition of the program is to support the mission and the work of non-profit and non-governmental organizations via the creation of design concepts that lead to the development of empowering solutions (which promote socio-economic development of local communities as well as individual life-improvements) and relieving solutions (reducing the suffering of people in emergency situations).

“Philanthropy by Design is about harnessing our creativity for humanitarian causes and sustainable development. We are fortunate enough to be in a position where we can help as a company, and we are proud that our activities can have such broad positive impact on peoples lives.”

Stefano Marzano, Chief Design Officer at Philips and founder of Philanthropy by Design
Our design approach

Our Philanthropy by Design projects, in keeping with our promise and believe to create meaningful and relevant design, are centered on a deep understanding of the real needs of people. The starting point is therefore always to analyze contextual insights and define the general requirements, as well as the related issues and obstacles, of the stakeholders we wish to help.

Co-creation

The primary goal is then to define the design brief along with the specific design requirements, together with the humanitarian organizations and any other parties who have been identified as key knowledge partners in the issue being investigated. Continuing in the spirit of co-creation, we involve them — together with complementary NGOs — in gathering local insights, in the idea generation process and in iterative concept development sessions.

Together we also co-evaluate initial concepts arising from these sessions, and define the best way to approach the ownership of intellectual property (when appropriate). Concepts and demos are generally tested by the people they are aimed at, in the proper context of use, so that we can generate first-hand feedback that will be used to further refine the proposition.

At the same time we will look for partners who can help bring the project to fruition (e.g. through local manufacture and distribution) as well as contributors for funding and additional NGOs and aid organizations interested in the use and dissemination of the new proposition.

Our contribution to social and environmental causes ends with the final concept design (including technical drawings and illustrations for the production of the solution and a training manual with specifications for its distribution and/or usage). As a design community it is not our intention to participate directly in production or distribution; we simply want to use our design expertise to initiate projects that can then be taken over and rolled out by other players in the value network. What is important is that concepts adhere to our brand promise of “sense and simplicity” and clearly improve the quality of life (particularly with respect to people’s health and well-being) among low-income and fragile categories of society.

In keeping with the general Philips philosophy

Philanthropy by Design is entirely in line with our corporate social investment policy. Since our founding in 1891, Philips has been working to improve social equity and environmental quality, under the maxim that “responsible business is good business.” To this day we support initiatives that improve people’s lives, particularly focusing on education and healthcare for the underprivileged. We encourage our employees to use their skills and expertise as volunteers. We value collaboration and value-exchange with stakeholders like Non-Governmental Organizations (NGOs) and local communities. And in the social responsibility projects we become involved in, we aim to be a key contributor and make a visible difference with our knowledge, expertise and products, rather than just being one of many different participants.

Who do we carry out Philanthropy by Design with?

Organizations who wish to work with us need to fulfill and respect a number of criteria and conditions. First, they should understand and embrace the overall Philanthropy by Design philosophy. They should work with humanitarian causes that address socio-economic and environmental issues in low-income communities. They should be able to communicate and interact both locally and globally. They should be politically and religiously neutral, i.e. they should be focusing entirely on improving people’s lives by tackling the issues which impede development, rather than promoting some subjective agenda. And they should be active or have a local presence in regions where Philips operates or has strategic business interests.
Who benefits from Philanthropy by Design?

Local communities
The short answer is that everyone involved benefits. For a start, the individuals and the communities we target with our Philanthropy by Design projects receive attention as well as practical support for some of their most pressing problems. For example, we often provide concrete improvements for end-users in terms of improved healthcare service or an increased level of well-being. We also provide community benefits through increasing healthcare awareness and developing skills of local workers who perform certain tasks/jobs.

NGOs and aid organizations
There are a number of advantages for NGOs and aid organizations as well. In Philips Design they find a well-resourced and committed partner who is willing to work together with them to drive advances in areas that have often been largely neglected but which are actually crying out for immediate attention. We offer them design and socio-cultural expertise, training where appropriate, support to generate insights when required and help deepen and contextualize information gathered by the NGOs themselves in the field.

Philips
There are also many benefits for our design community and the business. For instance, by initiating and participating in such projects we can demonstrate that we are delivering on “sense and simplicity,” both within the local context of the project but also globally (through communicating our involvement in – and commitment to – Philanthropy by Design). And we enhance the credibility of our people-focused competencies towards our “conventional” customers.

We also create competitive advantages. Indeed we explore new ways of working, better understand the potential of new technologies or the use of existing ones in an innovative way and gain valuable insights from areas we would otherwise probably not be active in. It becomes possible for us to create a portfolio of sustainable solutions which are not constrained by traditional business considerations.

In addition, we build up knowledge on future customers and markets, while creating a network of potential local suppliers (everything from NGOs and universities to independent entrepreneurs).

On an internal level we help strengthen employee loyalty, engagement and retention by giving people the chance to take part in what are unique and very rewarding projects. In doing this we demonstrate to people within the local context of the project but also globally (through communicating our involvement in – and commitment to – Philanthropy by Design). And we enhance the credibility of our people-focused competencies towards our “conventional” customers.

Early explorations
The idea of encouraging employees to visit low-income communities in underserved areas of the world to see for themselves the kind of problems that exist, and to consider how design may play a role in helping alleviate them, has been present at Philips Design for some time. Here is a typical example from the early 90s involving Tom Delaey, Product Designer for Healthcare at Philips Design.
The Philanthropy by Design Initiative was launched in 2005, when Philips Design organized an event entitled ‘A Sustainable Design Vision – Design for Sense and Simplicity’ in Eindhoven, the Netherlands. The event was attended by approximately 275 people from Philips Design worldwide, as well as some of the world’s foremost sustainability thinkers and practitioners (including representatives from leading NGOs like Save the Children and Médecins Sans Frontières).

The intention was to promote fresh thinking in envisioning solutions which could improve the quality of life in the most fragile categories of our society. This could, for example, involve relieving the suffering caused by cataclysmic events such as earthquakes, or by empowering NGOs and local stakeholders in stimulating economic and social development of communities.

Many of the topics tackled read like a roll call of the social and environmental global problems: malnutrition, pneumonia, malaria, sanitation, water purification, air pollution, lighting and illiteracy. Of the many possible solutions which emerged after one-and-a-half days of concentrated creative brainstorming, a few were identified as having the most potential for further exploration.

These ranged from ways of collecting and easily transporting rainwater to hand-held devices for helping people cope more easily with specific diseases, ingenious medical toolkits for ‘barefoot doctors’ in remote areas and engaging, playful ways of measuring children’s height and weight in order to determine whether they were malnourished.

**Tackling pneumonia, malaria and smoke inhalation**
A few promising concepts have been developed further in separate Philanthropy by Design projects. Each of these emerging concepts – safer and healthier cooking indoors; improved efficiency and quality control as well as simplified training in malaria detection and early detection of pneumonia – is highlighted and explained in the following chapters of this book.
Summary

Every year more than 1.6 million people in underserved areas of the world die as a direct result of smoke inhalation from indoor cooking using biomass fuels. The vast majority of these deaths are particularly distressing because they can be prevented relatively easily. Working in close co-operation with NGOs, self-help groups, local entrepreneurs and potential users, we co-created concepts for low smoke indoor stoves which can be easily produced and assembled locally, and which can reduce pollution from smoke by up to 90% in comparison with indoor open cooking fires.

Chulha

A low-cost, low-tech stove that leads to healthier and more efficient cooking
Philanthropy by Design

Context

What is generally considered to be a routine and unremarkable task in many western societies — sourcing and cooking food for an evening meal — is often an arduous, time-consuming and ultimately lethal activity in low-income or underprivileged communities.

Killer in the kitchen

Respiratory illness affects the health of the huge number of low-income people living in rural, underserved areas of the world who still cook indoors with biomass fuels (e.g. wood, crop residue, charcoal or dung). 2.4 billion people, which is more than a third of the entire global population, use biomass as their primary source of energy for cooking and heating. If you include coal, the number rises to 3 billion. This is having a disastrous effect on people’s health.

Many of these tragic deaths are avoidable; as an example, nearly 70% of rural households in India don’t even have ventilation. According to the World Health Organization (WHO), indoor air pollution from solid fuels is fourth among the risks to human health in low-income communities. In India it ranks even higher – third – just behind malnutrition and lack of safe sanitation & drinking water.

In addition there are also millions of cases of pneumonia, chronic respiratory diseases and lung cancer. The smoke produced by indoor stoves contains many dangerous elements like carbon monoxide, plus various small soot and dust particles. The WHO estimated that indoor air pollution is the direct cause of 2.7% of all diseases worldwide.

Social and economic implications

And it’s not just the direct effects of inhaling smoke that impact people’s lives. Respiratory diseases also have an impact on the economic situation: it is estimated that as much as 80% of a rural household’s expenditure in India can be eaten up by the cost of healthcare. There is also a social cost. Often children are forced to collect firewood for cooking, which could mean they are discouraged from going to school and compelled to walk long distances every day and carry heavy, cumbersome loads back to their house. Then there is the environmental perspective. In general, the cutting, transporting and burning of firewood takes place in an inefficient and unsustainable way.

Design challenges and insights

A problem in many different ways

For countless women in rural India — such as Savitridevi, a 53-year-old widow living in the village of Padvi — spending many hours a day cooking over an indoor open stove is the norm. Children are involved too: Managli, the 11-year-old daughter of a migrant worker, helps her mother cook while Kanthi, her younger sister, walks several km each day carrying up to 15kg of wet firewood on her head. And that means they can’t go to school.

What can creative design do to help women and children like Savitridevi, Managli and Kanthi continue with their traditional culture, while empowering them to select a way of cooking that does not disrupt their way of life or endanger their health?

Fulfilling various needs in India

When addressing such issues it became clear that we had to come up with a cooking solution which could fulfill various needs in rural and semi-urban areas of India. It would have to accept different biomass fuels (from wood to cow dung), be usable all year round – even during the monsoon – and at all times of the day (other solutions like solar ovens are obviously dependent on sunlight). It would also have to be flexible enough to meet people’s needs when cooking ‘chapatti’ (bread), steaming rice or boiling water, accept many different and sometimes non-standard cooking vessels (pots) and be suitable for distribution by various modes of transport ranging from vans to bicycles and even bullock carts.

We also concluded that in order to guarantee the highest possible penetration of local households, any solution would have to be affordable to as many families as possible. Local materials should be used in the construction of the solution wherever possible. The stove should be easy to use and maintain. It was also preferable to provide a mould which could then be used for small-scale, virtually ‘on-the-spot’ production of innovative yet low-tech stoves in village workshops. Intensive cooperation with local organizations was an important factor in understanding all these aspects.

All in all we wanted to come up with a solution for healthy and safe cooking which respected the culinary habits of rural Indian families, and which would also be able to stimulate local entrepreneurial activities in its production and distribution.

The view from the NGO side

“Total world deaths from indoor air pollution due to burning solid fuels are estimated at 1,619,000 each year: India alone accounts for 25% of such deaths: almost 500,000 of the victims are women and children.”

Source: WHO 2009
The proposition

Together with multiple local stakeholders we co-developed various versions of a stove (Chulha). With potential users, local stove entrepreneurs and a few NGOs we defined parameters, refined concepts, tested initial propositions to jointly come up with the final proposition.

Two versions

There are two different Chulha smokeless stoves: Samporna and Saral. The Samporna is an all-in-one unit intended for cooking/boiling and with an integrated steamer for preparing rice, lentils etc. The Saral is the more basic version without accessories. Both stove types are made of concrete and coated with local clay.

Gathering deeper insights

During the design process, extensive research in the field was necessary to collect all information required to develop a truly effective, context-specific solution. The design team - with the support of Green Earth, a local sustainable development agency specializing in grassroots behavior and social studies - gathered specific contextual insights by carrying out research in the villages of Kerwadi, Phaltan, Maltan and Karad, all in the state of Maharashtra.

The research consisted of an initial 3-day visit and introductory meetings with people from the villages, followed by one week of observations and in-depth interviews targeting four rural and two semi-urban families. Information was collected on local production and distribution channels, people’s insights on various cooking behaviors and culinary habits, user interaction with available devices, and people’s purchasing power.
The findings were used in a local workshop – attended by NGOs, self-help groups, two local entrepreneurs and two users – to help define key product features. Particularly fruitful was the cooperation with ARTI (Appropriate Rural Technology Institute), an NGO which develops and promotes innovative technologies to improve the quality of life in rural India and who have become our long-term partner in this project.

An iterative design process was carried out in 2006 and 2007. The most recent Saral and Sampoorna stoves appeared in December 2007, incorporating a number of final modifications.

**Lighter and more eco-efficient**
A new bypass tunnel within the stoves increases distribution of heat at the first ‘pot hole’ and brings greater thermal efficiency in general. The result is faster cooking times and a drastic reduction in the amount of fuel required. The stoves are also lighter than their predecessors, weighing approximately 10 kg (20-30% reduction).

**Easier chimney cleaning**
Another improvement has been to develop a bracket that fixes the chimney to the wall. In addition to helping the chimney last longer by making the construction sturdier, this bracket also acts as a hatch to open the chimney and clean it.

**Soot collector**
A further modification that has proved successful is the addition of soot collector: a small, disc-shaped grid made out of clay positioned at the bottom of the chimney which manages to filter out approximately 50% of the soot from the smoke. It can be easily removed for cleaning, and even after cooking just a couple of meals the collector is covered in black soot, which shows just how effective it is.

**Distributing free to NGOs**
This proposition is not actually a product that we manufacture ourselves. Instead, we have developed a package of information that we distribute free to NGOs so they can produce the Chulha themselves or train local entrepreneurs to do so. The package includes details and training about producing, installing and maintaining the stoves, and also helps create awareness on indoor pollution and healthy cooking.

**Design awards**
The Chulha has won several prestigious design awards: the IDEA Award 2008 (USA); the Red Dot Award 2008 (Singapore) and the International INDEX 2009 Award in the ‘Home’ category (Denmark). It has also been exhibited in New York, Copenhagen, Eindhoven, Shanghai and Seoul.

“The Philips Chulha can be a major tool in reducing the spread of lantana, in addition to the health and other benefits for the villagers. It can play a major role in environment protection and prevention of deforestation for cooking purposes. We have discussed this with the Forestry Department and they are excited about the potential to control lantana through this Chulha.”

Ramesh Venkataraman, Managing Trustee, Junglescapes Charitable Trust
The Chulha stoves are an excellent example of how finding out exactly what the intended users need and want, and then working together with local stakeholders to make this a reality, reaps rewards.

**Specific advantages include:**

- Being lighter and more modular means they are cheaper to transport.
- The ability to clean the chimney from the kitchen is major step forward; before – if there was a chimney at all – it often necessitated someone (almost always a woman) going on the roof and repeatedly lowering a cloth bag full of sand into the chimney using a rope. This was obviously a dangerous activity – injuries were not uncommon – and it also meant the soot that had accumulated in the chimney was forced out into the kitchen. As one woman who uses the new version of the Chulha commented, “Look at my walls! They are still clean six months after being painted!”
- The soot collector helps contribute to what was the main goal of the original Chulha project: to reduce indoor pollution and therefore almost certainly help reduce the number of people who become ill or die as a result of inhaling smoke from stoves that use bio-organic fuel.
- Encouraging and stimulating local players to take charge of the local manufacture and distribution of the stoves, and the utter simplicity with which the stoves can be made, encourages penetration in remote and relatively underdeveloped areas.

“**I have a large family to feed. For me the biggest benefit is the stove helps save 2 hours a day in my cooking.**”

Mochammi, 45-year-old villager

**Sustainability benefits study**

The social impact of such efficiency improvements is enormous. Greater efficiency in burning means less time has to be spent looking for fuel, which frees up valuable time to do other more rewarding tasks. More efficient cooking also saves time and money; those who cannot find biomass for burning often have to buy it instead.

According to the Pune College of Engineering, the amount of bio-organic fuel (e.g. wood or dung) required for boiling 1 liter of water was measured at 415 g for traditional stoves, 315 g for the Sampoorna and only 255 g for the Saral; a saving of almost 40%. The time required to boil the water was even more impressive; the Saral was almost twice as fast as a traditional stove.

We also carried out a sustainability impact study together with Junglescapes, one of our partner NGOs in India, and Mysore University. The study focused on people who were using these stoves in four small villages – Lokkere, Chik’thalutchi, Gudukere and Belawadi – situated close to Bandipur, one of India’s main tiger reserves. The aim of the study was to analyze the changes that had resulted from the use of the stoves, from the level of noxious gases inside houses to the social and economic benefits and the reactions of villagers.

As far as noxious gases were concerned, there was a decrease in the level of carbon monoxide, nitric oxide, sulphur dioxide and suspended particulate matter (soot) in all houses where measurements were carried out.

Users in many houses confirmed that cooking time has decreased, and this time could now be spent on other meaningful activities. In all houses there was a reported decrease in health problems like burning eyes, coughing and difficulty in breathing when cooking. The stoves were seen as an advanced and attractive-looking cooking solution by friends and neighbors. There was a high level of pride of ownership. Almost all users said the stove was easier to use, clean and maintain. As for the stove maker, he was producing approximately 10 stoves a month at a cost of Rs 1,000 (approximately €16), which represented a welcome additional income stream. In some cases, when families were too poor to pay such an amount, Junglescapes provided them with a stove in return for their help in carrying out forest management tasks.

From an environmental point of view, greater burning efficiency obviously means that less wood has to be used to achieve the same results. There was a reduced frequency of human-animal conflict because people had to make fewer trips into the forest to collect wood.

In the specific example of the Junglescapes initiative in Lokkere, using Chulhas has been identified as an important weapon in the battle against the rampant spread of lantana, an invasive, non-native weed which is aggressively replacing other plant species but which cannot even be eaten by animals and as such is virtually useless. Lantana can be burned in Chulhas, though not in many other traditional stoves, because the rapid heat generation capabilities of Chulhas matches the fast combustion and heat generation of lantana.

“**People like the stoves because of their performance but also because of the different look and feel. The flat top surface is reminiscent of the kind found on many liquid petroleum gas (LPG) stoves, which have a certain aspirational value for many. But the health aspect remains the most important of all. Let’s not forget that plenty of people who now use the Chulha used to cook in a house full of smoke.**”

Praveen Mareggudi, Product Design Consultant at Philips Design
The view from the NGO side

“The Chulha has a better chance of succeeding than other concrete stoves because it’s more attractive and has improved functionalities. The Chulha and its chimney are easy to transport due to its modular features. This allows quick assembly and gives the possibility to replace broken parts easily over time.”

Dr. Priyadarshani Karve, ARTI (Appropriate Rural Technology Institute)

The next steps

Going beyond India

Initially piloted in a limited number of villages in Maharashtra state, the Chulha has since been distributed by NGOs and local entrepreneurs in other states as well. But the problems associated with indoor cooking using biomass fuels are not just limited to India, so it was decided to investigate whether the Chulha would also prove equally as effective in similar contexts in other countries and continents.

We initially chose to target Guatemala. A project was initiated there to determine whether the Chulha initially designed for the Indian market could also cope with local cooking habits in this Central American country. During a field study a number of home visits were carried out to observe how Guatemalans prepare their main meals of the day. A workshop with HMA (Hombres y Mujeres en Accion) was also carried out to share and discuss findings and to introduce the Chulha to potential local partners.

Taking cultural differences into consideration

A number of differences were observed between India and Guatemala regarding contextual requirements. For instance, in traditional Indian homes people generally cook sitting down, whereas in Guatemala they do so standing up. Their diet also revolves around tortillas, beans and atole, a cornstarch-based hot drink, whereas in India a traditional meal almost always contains chapatti, vegetables, rice and dhal (a spiced lentil stew) in various combinations.

Learning from the field study, we came to the conclusion that the Guatemalan contexts would necessitate a substantial deviation from our existing proposition. The technological and design modifications necessary were so far-reaching that the end result would be expensive, making it difficult to set up self-sustaining mechanisms of local production and distribution, as well as making it less affordable for low-income families.
Therefore we decided not to extend our involvement in the Guatemala project any further. Naturally we will deliver the learning and the specifications we have developed so far to interested local NGOs and other parties, but other than that we will be focusing our efforts in socio-cultural and geographical areas that allow more immediate and effective results.

In this respect, another investigation has been undertaken in Kenya in collaboration with the NGO Tenda Pamoja. We carried out a field study to analyse local cooking conditions and also to gauge initial reactions to a number of the smokeless stoves (known by their Swahili name Jiko) which had been used as part of a pilot project.

A few cultural differences were observed. The majority of Kenyan women cook sitting on a low wooden stool no more than 20 cm high. They also frequently cook ugali, a paste made from ground corn, which unlike rice requires regular stirring. A traditional cooking set-up is to suspend the pot above the flames by wedging it between three large stones arranged around the fire. While this is inefficient in terms of wood burning, it does keep the pot in place during stirring.

At the end of 2010 the input from the research in Kenya was still being processed. Ultimately a series of recommendations for design adjustments will be drawn up. Once these have been implemented, we will be in a position to offer two different start-up kits, each of which has been based around specific user insights from the Indian subcontinent and East Africa.

Looking for new participants

In total, there are now several NGOs and foundations actively making use of our ‘low smoke stove kit’ to produce and/or distribute the stoves and educate people about the health and multiple benefits of the Chulha. In addition, other NGOs are in the start-up phase. But we are always interested to hear from NGOs and organizations who would be interested in becoming involved.
An affordable means of improving quality control and facilitating teaching in malaria detection

Summary
Malaria is a life-threatening disease transmitted by infected mosquitoes. Early detection and correct diagnosis are essential to save lives. However, malaria parasite identification in blood samples is not an easy task, even for ‘expert eyes’. Working together with Médecins Sans Frontières (MSF), we developed a portable, low-cost microscope kit which allows more rapid and accurate detection of malaria in remote areas, and which also facilitates the storing and sharing of sample images while simplifying field training.

Microscope kit
Context

Malaria is one of the deadliest threats on the planet. In 2008 alone, according to the WHO, there were an estimated 240 million cases of this mosquito-borne affliction, leading to approximately 863,000 deaths. You may think of malaria as an egalitarian disease in that it strikes people of all ages, male or female, regardless of creed or race. However, the statistics indicate otherwise. The vast majority of victims are children, and the disease is commonly linked to poverty; 90% of malaria-related deaths occur in sub-Saharan Africa.

Early detection is vital

Many measures are taken to try and combat this silent and insidious killer. Destroying breeding areas (pools of standing water), using impregnated nets, spraying insecticides and taking drugs (for those visiting infected areas) are some of the most common. There is also widespread ongoing research into drugs (for those visiting infected areas) are some of the most common. There is also widespread ongoing research into developing a vaccine. But, certainly for the foreseeable future, we have to accept the fact that hundreds of millions of people will still be bitten by malarial mosquitoes every year. Early detection of the disease is therefore of huge importance.

In countries with more advanced economies and sophisticated healthcare facilities, this is generally not a problem. However, in low-income regions it is. Very often the necessary resources are not available. Laboratories are poorly equipped, any available microscopes are very basic, the working conditions are far from ideal (e.g., lack of reliable electricity supply, dilapidated buildings, difficult access because of the conditions of the roads or due to extreme seasonal weather), and there are not enough properly-qualified staff to deal with the high number of patients who have to be processed.

Laborious process

Even when experts are available, it generally takes them at least 10 minutes to examine a single sample. While this may not sound like much time, consider the fact that one NGO alone, MSF, carries out approximately 6.6 million scans annually, which is equivalent to more than 100 years of non-stop work! The problem is further exacerbated when you consider that samples are often passed on to fellow experts for further validation and second opinions. This can take weeks when the samples come from remote clinics. Standardized quality control procedures also have to be carried out, whereby 10 samples (five weak positives and five negatives) per site per month (for each test) are checked.

False positives

Another problem is false positive testing. When there is doubt about an analysis then it is understandable that experts take a cautious approach, preferring to subject a patient to a course of treatment just in case they do have the disease, rather than declaring that treatment isn’t necessary when ultimately it turns out that it was. At MSF, they assume a false positive rate of 5%, which in their case equates to 140,000 people treated unnecessarily every year. Not only does this have an unwelcome price tag (assuming an average cost of $3 US per patient the total cost of this would be $700,000), it also increases the possibility that the malaria parasite will develop resistance to the drugs being prescribed, because people are less likely to finish their course of treatment if they don’t actually have malaria and the symptoms they originally complained about disappear of their own accord.

Human error

Then there is human error. Some estimates claim that clinical diagnosis in remote / disaster areas can be unreliable, with accuracy rates as low as 10%-30%. In many cases this is hardly surprising. As already mentioned, first-line health facilities and medical camps in many developing countries perform diagnosis using primitive laboratories and basic microscopes, and have to deal with a large number of patients in environments with poor infrastructural conditions.

All in all, it is clear that there is a definite need for analyzing blood samples for signs of malaria in a way that is fast, reliable, repeatable and easy to share – while remaining within the budget of even the most rudimentary clinics.

How do you catch malaria?

Malaria is transmitted by the bite of a female Anopheles mosquito. When a mosquito bites an infected person, a small amount of blood is taken, which contains malaria parasites. These develop within the mosquito, and about one week later, when the mosquito takes its next blood meal, the parasites are injected with the mosquito’s saliva into the person being bitten. After a period of between two weeks and several months (occasionally years) in the liver, the malaria parasites start to multiply within red blood cells, causing symptoms that include fever, headache, and – in severe cases – coma and eventually death.

The view from the NGO side

“The world of microscopy teaching would be completely transformed if it was possible to miniaturize the concept of microscope images being able to be displayed on small monitors. A small monitor screen could be attached to a microscope and images could then be seen by many trainees.”

Dr. Derryck Klarkowski, former doctor, MSF
Design challenges and insights

The design goal was to develop a portable and low-cost solution which would make it easier for microscope operators (microscopists) to carry out analysis of blood sample tests in remote/disaster areas by:

- Digitally capturing microscopic images of suspected infected samples in order to facilitate diagnosis and quality control
- Supporting local educational activities and skills development for malaria parasite identification.

**Using insights from MSF**

These design goals were based on insights generated by MSF personnel in the field. Given the vast experience and context-specific observations made by MSF staff in their missions all over underserved areas of the world, we capitalized on their knowledge to understand the various stakeholders’ needs and requirements in the malaria-detection process.

The MSF insights proved to be a rich source of information that helped us come up with a more people-focused solution. As an example, empowering a high number of local healthcare workers to continue effective screening and monitoring of suspected malaria victims was crucial. MSF places particular emphasis on training local people to carry out such work after experienced microscopists leave the area, because they operate only in emergency situations or in temporary camps, so knowledge transfer to locals is of paramount importance.

The proposition

**Simple concept**

The microscope kit is remarkably simple and based on the use of technological components currently available. The starting point is the traditional microscope used for blood sample analysis. The concept involves temporarily fixing a small, portable camera to one of the microscope eyepieces so it can capture an image of the blood sample being examined. A universal adapter lets the camera fit onto a wide range of microscopes.

This camera has a USB connection so the picture can be sent to a suitable storage device which also has a viewing screen and a straightforward user interface. In this way the images can also be easily shared for review when required. It was decided not to use a PC or laptop as a central device because in many situations they are too expensive and present too much of a temptation to potential thieves.

It is possible to connect a number of viewing screens (microscope simulators) to the central storage/display device to simulate the exact view seen through the microscope. This is very useful because it allows multiple healthcare workers to simultaneously analyze a single sample, and for the same reason it is also ideal for training purposes.

The microscope kit concept addresses four key areas:

- **Identification**: capturing quality digital images of the blood sample within the constraints of the working conditions typically encountered in the field in remote areas of underdeveloped countries
- **Quality control**: facilitating storage, review and exchange of these digital images and related information (easy sharing with colleagues and other experts for cross-checking of the diagnosis)
- **Time efficiency**: supporting the work of microscopists (saving time while maintaining quality of the performance)
- **Ease-of-use, especially for ‘non-professionals’**: supporting basic training and allowing user-friendly interaction between the user and the device.

“We made sure that our concept could make use of the existing microscope infrastructure and could be operated without extensive training or having to make significant changes to existing processes.”

Sven Weichert, Product Designer, Philips Design
The proposition, while properly-defined, has not yet been turned into a commercially-available solution. Partners are required to jointly take the next step and bring it to market. We are looking to talk to parties who are interested in developing this added-value proposition that combines global and local expertise, readily-available high- and low-tech components, yet only requires a low-budget investment. Involvement in this project combines an interesting brand and business opportunity with making a noble contribution to what is a globally-recognized social cause.

Large market potential
In terms of the potential market, it is obvious that such a relatively low-cost and easy-to-use solution would be of considerable interest to MSF, WHO (who has major interests in quality control), UNICEF and other smaller NGOs, as well as the Ministries of Health in various developing countries plus medical universities and training centers.

Fighting more than just malaria
Although the focus of this concept is on malaria, it can also help those across the (developing) world in their fight against infectious diseases like tuberculosis (13.7 million chronic cases and 1.8 million fatalities in 2007 according to the WHO), leishmaniasis (60,000 deaths annually, TDR 2009) and sleeping sickness (approximately 50,000 fatalities in 2009).

The view from the NGO side
“The proposed concept will have a big impact in helping MSF save lives. For instance, we will be able to monitor in real time the quality of the results being reported to clinicians, dramatically reducing the risk of an incorrect diagnosis. This design concept revolutionizes the training of microscopists: for the first time we will be able to take the classroom to the field. Trainers can train multiple students, replacing the current one-on-one situation, and these students will carry on the work of MSF once it is time to leave the area.”

Dr. Derryck Klarkowski, former doctor, MSF

Design-driven advantages
We have developed a smart yet simple solution which is even suitable for use in areas lacking in infrastructure and basic amenities. Due to the insight-based and people-focused nature of our design approach, there are a number of specific advantages for the various stakeholders, ranging from users to local healthcare workers and the communities at risk from malaria.

• Images of blood samples can be sent digitally for cross-checking, rather than the original samples themselves (at any given moment there are thousands of blood samples in transit across the globe). As a result, local microscopists save a considerable amount of time when seeking the opinions of colleagues and other experts, which ultimately means that patients are diagnosed quicker.

• Experts do not have to spend so long examining physical samples, because they will receive the relevant images in which a suspicion of malaria has already been identified.

• Training is also faster, because several healthcare workers can receive instruction at the same time (when multiple viewers are used), rather than having to train them one-by-one.

• Patients benefit from a more reliable diagnosis, avoid potentially unnecessary treatments and the additional related medical costs, and are less likely to contribute to the problem of drug-resistant malaria parasites.

• The cost savings are a very important aspect, because they are central to the potential business model envisaged for this malaria detection concept (fewer wrong diagnoses and therefore less prescription of unnecessary medicine results in savings far higher than the initial outlay required to purchase the microscope kit).

This has considerable social benefits. By potentially improving the malaria quality control procedure, we have addressed a healthcare challenge still considered at the very top of sustainable development agendas: better protection of low-income people at risk of infectious diseases.

From an environmental point of view, the digitalization of blood sample data potentially reduces air pollution and fuel consumption associated with the physical transportation of slides from remote medical camps / rural contexts to professional laboratories in urban areas. In addition, the casing of the microscope simulator follows eco-design principles such as design-for-assembling/disassembling and use of locally-available renewable resources like wood or paperboard for easy replacement and recovery.

The next steps

Fighting more than just malaria
Although the focus of this concept is on malaria, it can also help those across the (developing) world in their fight against infectious diseases like tuberculosis (13.7 million chronic cases and 1.8 million fatalities in 2007 according to the WHO), leishmaniasis (60,000 deaths annually, TDR 2009) and sleeping sickness (approximately 50,000 fatalities in 2009).
Rapid and inexpensive diagnosis of pneumonia

Summary
Pneumonia is the number one cause of death in children under five worldwide, killing an average of two million each year. One relatively simple and affordable way of detecting pneumonia is by counting the number of breaths taken every minute by a suspected sufferer. However, the timers currently used for this are often inaccurate and don’t last long enough. Supported by specialists from various organizations, including Save the Children, the WHO (World Health Organization) and the Nepal Family Health Program, we developed a Breath Counter which addresses the needs of health workers in the field trying to combat this insidious disease.
Design challenges and insights

Pneumonia can be diagnosed with a high degree of accuracy by counting the number of breaths taken by the patient in one minute. Those who are infected will have a much higher respiratory rate than those who are not.

But despite the relative simplicity of this method of detection, the current Acute Respiratory Infection (ARI) timing device often used to measure respiratory rate distributed by NGOs is basic and not always reliable. We collected feedback from organizations that use the ARI timer, such as UNICEF, Save the Children, WHO and the Nepal Family Health Program, and discovered that there is general dissatisfaction of both the accuracy and the limited lifespan of the device.

The view from the NGO side

“Pneumonia is a leading cause of the more than nine million deaths per year around the world in children under five years of age. The single most important intervention to reduce these deaths is prompt antibiotic treatment of childhood pneumonia by health workers. Determining whether or not children have fast breathing is a key step in assessing which children may have pneumonia and need antibiotics.”

Eric S. Starbuck, DrPH, MPH, Public Health Advisor, Save the Children

Context

Pneumonia is often referred to as the silent or forgotten killer of children, because it isn’t widely recognized by the general public as a major health problem. Yet it definitely is. Pneumonia fills the lungs with fluid, keeping oxygen from reaching the bloodstream and frequently results in fatality.

Physical examination of those suffering from pneumonia may reveal fever or low body temperature, an increased respiratory rate, low blood pressure, a high heart rate, or low levels of oxygen in the blood. Ideally, if pneumonia is suspected on the basis of a patient’s symptoms and findings from physical examination, further investigations – for example chest x-ray, blood tests or sputum cultures – are needed to confirm the diagnosis. However, in community settings and in underserved areas of the world where there is a scarcity of suitable healthcare facilities, pneumonia is usually diagnosed based on symptoms and physical examination alone.

It is the physical examination, and particularly the increased respiratory rate, which is most relevant when considering solutions for detecting pneumonia in low-income or underprivileged communities. In such situations there is often a chronic lack of amenities, with a shortage of everything from clinics and medication to reliable power supply. So for any concept to have a reasonable chance of success it has to be extremely simple to use, consume minimal amounts of energy and obviously be reliable and inexpensive.
Inaccuracy
Focusing on counting the breaths taken by a child for 60 seconds is not as easy as it sounds. The current ARI timer makes ticking sounds every second which users find distracting when counting breaths (often they begin to count the ticking sound rather than the breath). Inaccurate results can be also caused by non-registration of the count. To confirm results, the count should be repeated two to three times for each child. However, the ARI timer is unable to record any previous count made, with the result that caregivers often forget previous count results.

Short lifespan
Diagnostic work is also hampered by the short lifespan of the ARI timer. It does not provide any indication of the battery life, and in addition to the issues identified by the experts from the Ministry of Health. The study gave us insights into how pneumonia detection is often carried out in remote areas. We visited a district hospital, healthcare center and village clinic to observe, understand and analyze how pneumonia detection is accomplished, and also to test and validate our initial proposals.

As an example of the kind of observations gathered, we saw how wristwatches and mobile phones are frequently used to time the process. We also witnessed the inherent drawback of both methods: you can’t check the time and monitor the breathing simultaneously (your eyes flit between the timer and the patient), which compromises accuracy. Wristwatches are part of the standard medical equipment kit provided to every village clinic and should therefore be commonplace. However, during the research we never saw any actually working, either because they were broken or couldn’t be found.

The specific design challenges were therefore clear:

Improving accuracy – developing a device which reduces errors during the pneumonia classification test procedure.

Increasing lifespan – making sure that the proposition lasted longer than the currently available options and was also more reliable.

To address the issue of inaccuracy, errors in the pneumonia classification test procedure need to be reduced to minimize false classification. False classification is incorrectly diagnosing a child as negative (leaving the child untreated) or positive (causing a child to unnecessarily be treated with antibiotics, building resistance to the drug).

The second challenge is to ensure longevity, reducing or even eliminating the number of occasions in which a measuring device fails to work due to no battery power. For our solution, this was analyzed in the broadest possible context, meaning that we explored ways in which the Breath Counter would not have to rely on replaceable batteries at all.

Affordability
The second requirement is that distribution of the device to the local volunteers and healthcare workers should be affordable. As an indication, the cost of the first-line equipment such as a stethoscope, only available to high-level health workers but not volunteers, costs US$ 8. Therefore, the devices should cost less than US$ 8. The proposition should have a functionality-cost-lifetime ratio that can compete on value. (For example, if it just counts to 60 seconds but costs more than US$ 3.50 it should last longer than two/three years).

Eco-design
Another implicit consideration in this project was to address a few environmental design aspects by adhering to four basic principles of eco-design: reducing material usage; optimizing distribution systems (e.g. reducing transport volumes); lowering environmental impact during use and optimizing initial lifetime (e.g. cutting production costs while supporting repair and maintenance).
The Breath Counter has already won two prestigious design awards, the IDEA Award 2009 (USA) and the iF Product Design Award 2010 (Germany).

The proposition

First and foremost, the Breath Counter can be operated easily, simply by pressing the top button to start the timer and pressing the center button to register each breath taken for one minute. The result is displayed on the LCD screen. The count result is recorded and second and third tests are automatically set up for the same child. The three test results are shown together on screen, making comparison easy. In this way the device provides an easy way of generating accurate count results, while allowing classification of pneumonia to be carried out by the caregiver. Additionally, the device can also be used only as a 60-second timer if the caregiver chooses not to use the breath registration function.

The Breath Counter has been developed to save children’s lives by supporting accurate pneumonia detection by healthcare workers in remote areas. It is designed specifically in response to the shortcomings of current pneumonia detection procedures, namely inaccuracy of counting breaths and short lifespan of the timer used.

Megumi Fujikawa, Former Interaction Designer, Philips Design

A key feature of the Breath Counter is that it is powered by solar cells, a renewable energy source, rather than by disposable batteries. It is always ready for use when a child needs to be tested. For those who cannot read, Philips Design created a simple manual with clear visuals that explain the procedure.
There are many social benefits associated with using the Breath Counter. Obviously the most important is reducing the child mortality rate, one of the 10 Millennium Development Goals. It also addresses another of the goals, namely combating diseases. On a local level, having such a simple way of detecting a potentially fatal disease among children should have a huge impact on the general well-being of rural communities (how devastating it must be for families to lose children through preventable causes). Parents will spend less time caring for sick children, which means they can focus more on other necessary tasks.

From an environmental point of view, the design of the Breath Counter represents a significant step forward when compared to what is currently available. By harnessing solar energy, it taps into an inexhaustible source of renewable energy and therefore has zero carbon footprint during operation. The absence of disposable batteries also means you avoid the possibility of empty ones being discarded into refuse piles or being simply tossed into the street (there are unlikely to be proper collection facilities in remote, underdeveloped regions). There is also less waste and consumption of resources on product level; the Breath Counter is designed to last far longer than its predecessor.

The view from the NGO side

“With the proposed new functions, the Breath Counter will have a big impact in helping health workers assess children for pneumonia, and saving lives in high mortality settings where few children have access to doctors or hospitals. Through the creative process, limitations of accuracy and longevity of the current device have been effectively addressed. The solar power solution is ideal for this product, which is required for this critical procedure”.

Eric S. Starbuck, DrPH, MPH, Public Health Advisor, Save the Children

Specific advantages include:

* The count test result is shown clearly on an LCD screen. The device currently in widespread use to help measure children’s respiratory rate, the ARI timer, does not have a facility for doing this. The results of a second and third test can also be shown on the same display for easy comparison.
* The device keeps the record of the last count result and automatically sets itself up for the second and third tests for the same child. This is obviously very convenient but also reduces the chance of error in carrying out three tests.
* As it is powered by solar cells, the Breath Counter does not require disposable batteries. This brings a variety of important benefits: it lasts longer than the current ARI timer (potentially longer than five years); there is no need to spend money on replacement batteries; and it is always available when a child needs to be tested because there’s no interruption in performance due to batteries being empty and/or no replacements being immediately available.
* For those who have difficulty recognizing the numbers shown (for instance due to poor eyesight or illiteracy), the device has the option to be used purely as a 60-second timer with audio signals.
* The Breath Counter has a deliberate ‘medical’ design style to underline the commitment and contribution it makes to supporting front-line care in underdeveloped and often remote areas. While not coming across as intimidating, it creates the impression that it is a serious piece of equipment that should be handled and used with care.
* To support the use of the Breath Counter and to make it accessible to a wider audience, easy-to-understand instructions for use have been provided which only utilize images and icons – and no text. This has a double benefit of being understandable by illiterate caregivers, and also being applicable in many different countries and regions without having to worry about translating text into local languages.
The next steps

During our field study in Malawi we gathered feedback on the use of the Breath Counter demonstrators in real-life situations and then we used these observations to refine the design.

Incorporating feedback from the field
Some extremely useful user opinions and contextual insights were gathered. For example, it became clear that while the overall shape of the device was appreciated because it fits perfectly into the hand and is held in a very natural way, the device should be about 25% smaller than its current size. It also became apparent that the legibility of the screen wasn’t optimal, mainly because there was too little contrast between the background and the digits on display especially when it was used outdoors in sunlight. Issues which arose in Malawi will now be addressed and incorporated into an improved version of the Breath Counter.

Looking for partners
The project is now in the finalization phase, and we are looking for partners to help get the product into production. It should be noted that it was always the intention to deliver an appropriate design solution in a spirit of open innovation, i.e. by involving external parties and sharing expertise whenever appropriate.

The most logical market for the finalized solution would be organizations that are already addressing the problem of early pneumonia detection. Obviously the NGOs we have already had contact with are of particular relevance, but other organizations who are active in this field have also expressed interest.
Philanthropy by Design
Recognition

Various Philanthropy by Design projects have received global media attention and have won some of today's most prestigious design awards.
Acknowledgements

Philanthropy by Design
Program setting:
Stefano Marzano (founder of the initiative), Yasushi Kusume (program owner), Simona Rocchi (program content creation), Bas Griffioen (project management).

Projects design team:
Megumi Fujikawa, Umesh Kulkarni, Praween Mareguddi, Mine Danisman Tasar, Dirk Vananderoye, Sven Weichert.

Workshop participants and project contributors:
We are grateful to all Philips Design employees who contributed to ‘A Sustainable Design Vision’ start-up workshop, and to the development of the Philanthropy by Design initiative over the years. In particular, we would like to thank: Neha Ahuja, Brandy Amato, Vincent Buil, Koel Chatterjee, Ange Dunselman, Lorna Goulden, Chris Haverstock, Erik Johnson, Abhimanyu Kulkarni, Marco van Leeuwen, Lira Nikolovska, Laura Nino, Annika Noren, Rhonda Parton, Fiona Rees, Jon Rodriguez, Eckhardt Schraven and Alex Tan.

NGOs, community stakeholders and aid organizations
We would like to thank the various organizations and the local communities who have contributed to our program, whether through their cooperation, support, advice or encouragement.

Special thanks go to the following people:
Appropriate Rural Technology Institute – Priyadarshani Karve, India; ERIN Foundation – Sai Prakash, India; Hombres y Mujeres en Acción – Ken and Lois Werner, Guatemala; Junglescapes Charitable Trust – Ramesh Venkataraman, India; Medicines Sans Frontières – Derrryck Klarkowski, The Netherlands; Nepal Family Health Program – Dilip Poudel, Nepal; Save the Children – Tyeesa Chimuna and Salim Sadruddin, Malawi; Eric S. Starbuck, USA; Self-help groups – Mahalaxmi and Dhanalaxmi Bachat Gat, India; Teenda Panoja – Otto Bekouw and Jackie Bekouw, Kenya; UNICEF – Ludo Scherlinck, Denmark; WHO – Shamim Qazi, Switzerland.

Universities and research contributors
Approvecho, College of Engineering of Pune, Green Earth Consulting, Mysore University, Socio Economic Development Trust, India.

Photography
Pictures provided by Tom Delaey, Bas Griffioen, Derrryck Klarkowski, Umesh Kulkarni, Praween Mareguddi, Simona Rocchi, Christel van der Steeren, Sven Weichert among other Philips Design employees.

Others
Ashabai’s and Bhosle families, Vaishali Bhosale, Derek Brookman, Simon Hodges, Shakuntala Ingle, Henk van der Weij.

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Bringing a vision to life

We believe that Philanthropy by Design projects enable us to support social innovation while at the same time contributing to business innovation.

Improving the quality of people’s lives through design is at the core of the Philips Design vision. Philanthropy by Design projects bring this to life.
Philips Design is one of the longest established design organizations in the world, with studios located in Europe, Asia and North America. At Philips Design we know that we can only create meaningful and relevant solutions by having a deep understanding of people’s needs and desires – and it is this belief that drives our creative force of over 550 professionals.