

ENGINEERING FOR SOCIAL INCLUSION IN BUENOS AIRES

By Erica J. Lee, P.Eng.

As a volunteer project manager for educational non-profit organization Waste for Life, Erica Lee oversaw the implementation of a simple manufacturing process in a recycling co-operative in Buenos Aires, Argentina. The project's most important deliverables were non-technical: social inclusion, democratization of knowledge, and access to the ability to alleviate poverty through strategic use of technology and entrepreneurship.



USING TECHNOLOGY TO SERVE humanity is not a new concept. Rather than seeing themselves as professionals whose only role is to efficiently execute a predetermined agenda within a corporate or industrial structure, many engineers seek to leverage their skills by serving development. Many definitions of development are available, the simplest being enhanced economic growth and participation, but development can also extend to social objectives, such as democratic participation and empowerment over one's life.¹

Many engineering students seek academic projects with social and democratic objectives, often through a phenomenon known as service learning. But practising engineers can also leverage their skills for social good as an alternative to the status quo in the profession. Instead of performing a service pulled by an economic, industrial or market force, in which the impact on people, environment and justice may not be significantly considered engineering, they can deliver social benefit by using their professional skills.

One example of an organization that provides such opportunities is the non-profit Waste for Life, which has its roots in education. The two co-founders, Eric Feinblatt and engineering professor Caroline Baillie, PhD, gave opportunities to more than 60 students in developing the core concept: to improve the livelihood and social status of waste pickers by allowing them to transform plastics into new materials.

The method to achieve this transformation was partly a technical solution: creating



Waste pickers make their way through the streets of Buenos Aires to look for paper, cardboard, glass and plastic.

an affordable, simple compression mould that could be provided to waste picking co-operatives to convert worthless waste plastic into useful composite materials. More importantly, however, was strategically providing access to credit, design, manufacturing and entrepreneurial know-how to enable these impoverished and marginalized people to leverage that simple technology to transform their lives. Though the hot-press can be used to make building materials or other items for domestic use, in the case of the Buenos Aires project, the preferred approach was the formation of a “social enterprise”—an organization that applies business strategies to achieve philanthropic goals.²

Approximately 2 per cent of the population in developing cities scrapes together a living from scavenging waste.³ Therefore, the Waste for Life concept—once proven in the field—could

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be replicated in many countries. In fact, Waste for Life had already run a pilot project in Maseru, Lesotho. Buenos Aires, Argentina, was subsequently identified as fertile ground to further test the concept, due to its strong co-operative movement and the presence of many waste picking co-operatives.

After Argentina's economic collapse in 2001, unemployment soared to 18.3 per cent seemingly overnight.⁴ To obtain some form of income, as many as 100,000 people began to collect and sell recyclable items from household waste left in the streets of Buenos Aires. A decade later, an estimated 15,000⁵ people in the Greater Buenos Aires area support themselves and their families by recovering recyclables out of this waste—living an average of 34 per cent⁶ below the poverty line.

Because most Argentine households do not separate recyclable items from wet garbage, waste pickers must often open up and rifle through plastic bags of garbage to retrieve bottles, cans and paper, a messy, unhygienic job that tends to create further mess in the form of split and open bags left on the street. This is one of the reasons that waste pickers are socially marginalized, despite performing the very useful function of diverting approximately 13 per cent of materials from the city's already limited landfill capacity.⁷

The Waste for Life Buenos Aires project had three goals: create an increased income source for local waste pickers; reduce environmental impact by providing a local recycling channel; and produce socially favourable outcomes in accordance with Waste for Life's stated mission:

Waste for Life is a loosely joined network of scientists, engineers, educators, architects, artists, designers and co-operatives working together to develop poverty-reducing solutions to specific environmental problems. We use scientific knowledge and low-threshold/high-impact technologies to add value to resources that are commonly considered harmful or without worth, but are often the source of livelihood for society's poorest members. Our twin goals are to reduce the damaging environmental impact of non-recycled plastic waste products and to promote self-sufficiency and economic security for at-risk populations that depend upon waste to survive.⁸

In early 2010, the Waste for Life network had collectively completed three years of materials development, machine design and feasibility studies, and was entering the implementation phase. I joined the organization as a volunteer project manager and spent five-and-a-half months with the project. I used the same suite of tools acquired in my career as a manufacturing engineer, project manager, Six Sigma black belt and lean/kaizen practitioner to facilitate the startup of the hot-press scheme.

PARTICIPATIVE VISION-SETTING

As with any business or industrial project, the success of the Waste for Life Buenos Aires project could not be achieved without first being defined. Since Waste for Life's principles were underpinned by democratizing knowledge and helping members achieve self-sufficiency, the process of defining success had to be participative. The main ideas that came from these sessions were to:

- increase social inclusion for waste pickers;
- create opportunities for shifts in what co-operative members feel is possible for themselves—a key shift in creating effective and lasting reductions in poverty;
- decrease poverty—not necessarily limited to increasing income;
- divert plastic from landfills;
- create networks for increasing social justice;
- increase awareness in professional and educational communities;
- support the co-operative movement (worker-owned enterprises);
- maintain a high level of ethical responsibility; and
- minimize bureaucracy and control structures.

I oversaw the compiling and discussing of these ideas among the various groups, including the Waste for Life founders, and organized their relative importance to help determine what actions were necessary. Paradoxically, my direct involvement was completely at odds with the critical idea that the co-operative be capable of carrying out all of these activities itself. Therefore, I constantly sought to draw out members of the support team and the co-operative to make decisions and definitions. One year after beginning, all of these goals have been achieved to one degree or another, though only anecdotal evidence is available to support their achievement. For example, an upscale art gallery in Buenos Aires agreed to sell their products and invited members of the co-operative to attend an opening in late 2010—an occurrence that would not have happened without the collaborative opportunity this project presented.

STAKEHOLDER ENGAGEMENT

In searching for a co-operative with which Waste for Life could partner, we knew three criteria would be important in assessing potential partners. Technical criteria: Do they have the proper infrastructure, including a safe and feasible place to put the hot-press, an adequate physical building and an electricity source? Are they willing to use the personal protective equipment? Financial criteria: Had they defaulted on a loan and are their financial processes transparent and accountable? Organizational criteria: Do they have a stable culture, reasonable level of cohesion and lack of conflict, a positive, can-do attitude, and demonstrated willingness to work through obstacles? This was important, as Waste for Life is committed to a “do no harm” approach, both finan-

cially and in terms of physical safety. Finally, are they willing to maintain partnership with Waste for Life and share their experience to empower other co-ops? The development and dissemination of knowledge and experience is essential to creating a model that Waste for Life can openly validate and replicate.

The Nueva Mente co-operative was selected as the pilot test co-operative in November 2010. Arrangements were made for a local co-operative microfinancing organization (The Working World/LaBase) to administer a loan to them to commission the hot-press and necessary accessories from a local manufacturer, with money raised by Waste for Life as collateral against paying back the loan to LaBase, since the solvency of the co-operative's hot-press venture was not yet known.

CHANGE MANAGEMENT

On March 18, 2011, the hot-press was delivered to the Nueva Mente co-operative. At that point, the members of the co-operative did not know what to expect from the project. The project and the idea of the hot-press were familiar and generally positively, or at least politely, viewed by the co-operative members. Upon receiving it, they did not feel an automatic sense of ownership of the press, or trust it would create any real benefit for them. I consequently spent several days in the co-operative demonstrating the press, and though some of the co-operative's adult members tried out the hot-press, the main participants were local youth, many of them children of the waste pickers. They were eager to participate and had the time and energy to devote to the project.

STANDARD BUSINESS AND MANUFACTURING PROCESSES

Following another round of consultation with the team, I oversaw the setup of a workshop area for the hot-press. Appropriately, the work area was constructed largely from recycled elements: tables were made of scavenged metal doors and visual aids for the workshop walls were made of recycled art projects.

After choosing the first product the co-op would produce for sale (a wallet designed by students at the Rhode Island School of Design), I timed out the steps required to make each one, and created visual aids to help the participants recognize the key quality characteristics (i.e. the things that would make a sellable product). The importance of sharing lessons learned, and doing things repeatably and consistently were a few of the key messages.

I also divided the overall business cycle of the hot-press scheme (design, produce, sell, evaluate) into steps, and assigned responsibility and metrics for each. The business cycle comprised designing new products as well as the subsequent steps of commercialization, sales and profit distribution, plus a monthly review to determine the success of each step. Again, the participative nature of the project meant there was no way to mandate or enforce outcomes. It took several months for the idea of a design cycle with defined responsibilities and tracking systems to take root. But over the course of the three months I spent with the hot-press and the team in the co-operative, the output of production and quality began to stabilize significantly. On the day I left, we had achieved our goal of 30 saleable wallets for a local design fair, all of which did indeed sell.

TEAM-BUILDING

A local support team was recruited to oversee, train and facilitate project participants' progress until they are ready to assume complete ownership of the project. Though the support team members all shared an interest in social change, their backgrounds were diverse: industrial designers, small business owners, community organizers, artisans and university students. I could not always intervene or participate in the shared Argentine cultural assumptions, or see underlying tensions. I relied on the shared definition of success we'd built together to keep everyone working in harmony. Since no money was available to provide them a consistent salary, finding individuals with the necessary social, leadership and technical skills to continue to manage and sustain the project after my term was a challenge. As in all successful change management strategies, appealing to the inner motivation of each team member proved a successful strategy for engaging the support team to work without financial compensation.

DEVELOPING A CO-OPERATIVE BUSINESS MODEL

Any proceeds from the sales of the hot-press goods, once returned to the co-operative, needed to be split equitably. It was not appropriate for me to decide what an equitable split should look like; however, at that point I had complete visibility on the entire project. The eventual paying back of the micro-loan was also stated as a project goal, but not at the expense of allowing the team to develop a healthy cashflow that would lead to more commitment to the project. The co-operative was the owner of the press, but not all members of the co-operative worked on the press and not everyone working on the press was from the co-operative. I facilitated the conversation in which the most fair and sustainable split of the proceeds would be realized.

CONCLUSION

As of late 2011, the project was thriving under the name Contenido Prensado (Contents under Pressure). Six full-time team members assumed responsibility for the main parts of the business cycle, and the local support team continues to guide and facilitate their progress. The participants divide all proceeds among themselves in a democratic economic participation model they designed. A portion of each sale is

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helping repay the hot-press loan. None of the participants in the project had design, manufacturing or business experience, and now they can earn up to triple their previous earnings from scavenging alone.

Having just completed a major contract with the local municipality to produce garbage cans for the local eco-reserve, the Contenido Prensado team is prototyping other items for sale to the general public. Other waste picking co-operatives in the Buenos Aires area have expressed interest in adopting the hot-press scheme and some formal plans to replicate implementation in other developing countries are in process. Waste for Life is also planning further collaboration with North American universities to design other machines (shredders, extruders, for example) to deepen the co-operatives' processing and manufacturing capacities.

This project represents not only an interesting and creative fusion of technology, design and recycling, but also demonstrates a profound potential to transform lives—all made possible by engineers working outside the box.

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WHAT'S NEXT FOR ONTARIO'S GREEN ENERGY ACT?

By Tom Carpenter, Warren E. Mabee and Justine Mannion

ONTARIO'S Feed-in Tariff (FIT) program, introduced just two years ago via the *Green Energy and Green Economy Act*, has led to the rapid development of new generation capacity across the province. The FIT instrument lets Ontario purchase green power at a guaranteed amount over a contract period—usually 20 years—which, in turn, encourages investment from generators at all scales (Cory et al., 2009; Sovacool, 2009).

In Ontario, landfill gas, biogas and biomass-to-electricity and wind power have the lowest FIT rates—between \$0.11-0.15/kWh—while the

rates for solar photovoltaic projects are significantly higher, ranging between \$0.44-0.80/kWh. The Ontario FIT rates were set to provide acceptable rates of return based on technology and installation costs, as of 2009. It is important to note that some technology prices have adjusted rapidly since the Ontario rates were announced, particularly for solar power, where prices have dropped dramatically.

Those who watched or participated in the recent provincial election know the cost of green electricity was an election issue, and there is speculation that the commitment of the Liberal government to the *Green Energy and Green Economy Act* cost them significant support, particularly in rural areas. As of November 2, 2011, the Ontario Power Authority (OPA) has announced that new (and presumably lower) FIT rates will take effect retroactively as of September 1, 2011. The OPA has also announced that depression, rather than escalation, will be a component of the new program.

COMPARING PROGRAMS

Ontario's renewable electricity program is based on policies in countries like Germany, which has used a FIT mechanism to promote green power for over a decade. In our province, as elsewhere, the main drivers for creating the FIT are economic growth and job creation, as well as the desire to be one of the leaders in implementing renewable energy across the global energy sector (Ontario, 2009). Investment in renewable energy projects is expected to create jobs and wealth during project development, and tax revenues and job opportunities for various stakeholders (communities, First Nations, farmers and landowners, and industry) over the life of the facility. Developing renewable energy is also partly a response to the demand challenges associated with Ontario's decision to stop coal-powered electricity generation, scheduled to end by 2014 (OPA, 2010).

The OPA estimates that, to date, the renewable electricity sector has contracted 3000 MW and created 13,000 direct and indirect jobs (OPA, 2011a). This works out to about 4.3 jobs per MW, with many projects still in the early phase of planning; ultimately, the total number of jobs might be greater than 6 per MW installed (as estimated by Little and van Berkel, 2006).

In Germany, renewable energy development is a tool to meet an intergovernmental target set by the European Union (EU). There is an expectation that Germany will meet its targets and its EU commitment, which likely creates confidence among investors and industrial concerns that explore renewable energy development within the country.