IEEE Humanitarian Activities Committee

Failure Report

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Introduction

Welcome to the inaugural failure report of IEEE's Humanitarian Activities Committee. Our goal in this first issue is to share a few stories of failure and learning from IEEE members participating in programs like the Special Interest Group on Humanitarian Technology (SIGHT). By sharing these personal stories, we seek to encourage a culture that tests new ideas and maximizes organizational learning. While we have all had "learning experiences", most of us are reluctant to share them for fear of being associated with wasted time and effort, false starts, or unattained goals.

The IEEE Humanitarian Activities Committee (HAC) has embraced the principle that, given the complexity of our work, there is no success without failure. We must learn through the process. This report documents stories from across IEEE (North America, South America, and India); stories of things that we tried, things that didn't work out as expected, and the lessons we learned along the way. Our intention is to foster an organizational culture that encourages the risk-taking, creativity, and continuous adaptation required for innovation. We know that ideas gain in value by the degree to which they are adopted, and that wide adoption of ideas is limited by the ease with which they can be shared. With this report, we hope to tear down the obstacles preventing the sharing of lessons learned: the invaluable result of some dreaded experience that we do not want to repeat.

My hope is that as time passes, we will see IEEE gaining maturity in how it engages on development and humanitarian activities, how it adapts to changing contexts, and how it nurtures a community of global engineers dedicated to advancing technology for the benefit of all humanity.

Sincerely,

Alfredo Herrera, P. Eng. IEEE-SM
IEEE HAC Communications sub-committee chair
IEEE. Advancing Technology for Humanity.

Access to Sustainable Projects on Humanitarian Technology in Argentina

Marcelo Fabián Agüero

Located in South America, Argentina's geographic location and vast area (approximately 3 762 000 km^2) mean that there is great diversity across the country's 22 provinces. Take climate, for example: Argentina includes tropical, subtropical, and polar climatic zones. Owing to this diversity, the possible activities of IEEE Special Interest Group on Humanitarian Technology (SIGHT) are expansive and are sought after across the country.

As the SIGHT Coordinator for Argentina, I attended a Student Branch National Meeting (Reunión Nacional de Ramas Estudiantiles, or RNR) in the province of Córdoba, where I explained the guidelines to apply for funds through IEEE's SIGHT program. SIGHT volunteers from Córdoba province to Tucuman and Patagonia were interested in securing funding for projects from their Student Branches.

Student Branches usually encourage innovative activities that allow for the development of interesting projects, and because of this, it can be very effective to promote activities in these areas. Here, young people can develop projects for human benefit by using new innovative technology, while Coordinators in Latin America and the Caribbean, like myself, help these Student Branches grow and improve over time. My goal was to encourage SIGHT to adequately fund to provide the Student Branches across Argentina with the support to get the funds they needed to get started, and support SIGHT volunteers in setting clear objectives and goals for their projects.

If we were successful, we could greatly increase the initiatives working to improve quality of life for marginalized people in Argentina – people with no access to basic services such as electricity, or drinking water – all while taking sustainability and environmental concerns into account. Since 2013, however, I have failed in my efforts to secure funding for the projects presented in Argentina.

I have learned that the activities of the Student Branches need to be supervised by Coordinators until the formal request for funds is secured. To do this, Coordinators must interact with Student Branch project holders, which then requires Coordinators to support projects over several provinces. Additionally, visiting the interested Student Branches across the country requires

"If we were successful, we could greatly increase the initiatives working to improve quality of life for marginalized people in Argentina."

the funding that makes travel possible. In Argentina, I failed to accurately estimate the funds required or the demands on my time to support the Student Branches in this way – and in the end, underestimated the negative impact this failure would have on our ability to secure funding for the Student Branches.

As a result, the University demand for humanitarian-focused technology is not satisfied, and while Argentina has a high level of academically excellent students, there are still inadequate economic resources to fund this demand for humanitarian technology.

I know that the Student Branches are capable of meeting this demand, and I continue to try to find ways to secure funds for them.

To alleviate the burden on the Coordinators, I will focus on changing processes so that projects can be evaluated using reports to indicate progress. In this way, the Student Branches can remain connected and committed to IEEE, to their universities, and to the population of their regions as they work to improve the quality of life for marginalized people with innovative technologies for humanitarian benefit.

Help Is Close to Home

Nirupama Prakash Kumar

Starting the Special Interest Group on Humanitarian Technology (SIGHT) in the United States after serving in the Humanitarian Activities Committee (HAC), I had some grand visions. I found like-minded people in the HAC and SIGHT committees I served in, and we dreamt of changing the perception of the engineering profession in America and around the world. We also wanted to provide an alternative to the forms of engineering humanitarian work that encouraged people to work in other countries.

It is not that there isn't important work to be done in other countries – there certainly is. But we believe that we cannot let that blind us from the impact we can, and should be having in local communities as well. By encouraging local engineers to work with their communities on local projects, we would help engineers think about their communities and change the very fabric of communities around the world. Or so we thought.

"...[W]e would help engineers think about their communities and change the very fabric of communities around the world. Or so we thought."

As work progressed, Latin America and India had a surge in SIGHT groups, and most of them were trying to look at their local communities and do good for them. Our efforts with American IEEE sections, however, fell flat.

At American IEEE gatherings I presented on an array of local issues: hunger, poverty, frequent incarcerations of young men – most without good role models to look up to – lead-poisoned water, and others, all plaguing less-fortunate communities. But I failed to help our volunteers see that they could tackle these issues. As a result, our IEEE volunteers are not as involved as they could be in addressing American problems.

I learned that encouragement and education on these issues isn't enough.

At SIGHT, we realized that we need to do a better job of highlighting the incredible opportunities to make change in the United States, and so we are in the process of developing a communication campaign to bring awareness to the impact American members can have here at home. For example, in places like Flint, Michigan, our engineers can help monitor water and air quality. On issues like hunger, our engineers can encourage better technology adaptation for better food distribution. In education, our engineers can develop skills-based training for kids dropping out of school, or provide better mentoring for kids to enter and stay in STEM fields. We are hoping this campaign not only encourages our existing volunteers to make positive change in their communities, but also attracts new engineers to IEEE who are interested in creating change here at home.

"Where engineers look around, no matter the country, and think: "how can my skills make my community better?"

Humanitarian technology work is needed everywhere, and it is our role at SIGHT to mobilize our volunteers to tackle some of our toughest challenges. Increasing our effort to highlight local opportunities is the next step in changing the face of the engineering profession, where engineers look around, no matter the country, and think: "how can my skills make my community better?"

Dilemma: Grid Extension vs. Isolated Microgrid

Rodrigo Palma-Behnke, Guillermo Jiménez-Estévez & Marcia Montedonico

Energy Center, FCFM, DIE, Universidad de Chile, SERC Chile

Chile exhibits enormous renewable energy potential for both large-scale and distributed energy solutions. Because of this, interest and understanding of microgrid development has been on the rise for several years. In 2013, a company asked the Energy Center (EC) for the design and construction of a microgrid in a small, isolated village. The village was approximately eight kilometers away from the main grid, and the grid extension project for this village had been stalled for several years because of a lack of budget, other local government priorities, and bureaucracy.

The social responsibility area of the company offered a limited budget for the initial phase of the microgrid project. The EC proposed a project roadmap based on the following steps:

Develop a photovoltaic (PV), battery storage, and genset solution for the local school;
Develop an isolated microgrid for the whole village with an additional PV plant, wind turbine, battery storage, and diesel back-up; and
Further integrate the local microgrid to a grid extension, making the best use of both the local renewable energy resources and the electricity connection to the grid.

This approach was approved by the company and the local government. The school project (#1) was developed, implemented, and successfully tested.

Months later, despite the project roadmap the local government and distribution company started a negotiation for the grid extension solution without the participation of the EC, deciding that the grid extension solution without the microgrid (#2) was much more cost-effective. Their main concern with the microgrid was that it would decrease the demand for energy. The tariff model for distribution companies in Chile caused the distribution company to worry that they would not recover their costs if power injections from the local microgrid caused sales to drop.

In the end, the microgrid project was not approved and the original grid extension project was built. As a result, the school solution was no longer needed and its sustainability is questionable.

From our perspective, our big failure was to rely on the agreement that outlined the roadmap, without realizing that we had failed to incorporate all the

"This experience shows us that a more proactive mindset is needed for these new paradigms in the energy supply."

interested stakeholders in this initial framework, specifically the distribution company.

This experience shows us that a more proactive mindset is needed for these new paradigms in the energy supply. More and better arguments are needed to show the benefits of the combination of grid extension together with the best use of local renewable energy resources, instead of relying on the traditional way of looking at grid extension versus an isolated microgrid.

As a result of this learning, the Energy Center has created a new area to address social-environmental topics. The area is composed of an interdisciplinary group of professionals: agronomists, anthropologists, sociologists, and geographers. Together, with the whole EC we are developing a new methodology for the relationship with communities and stakeholders, calling it a "co-construction approach". The methodology involves participatory diagnosis and team building; socio-technical system design and sustainability plan; implementation and first impression; and operation, evaluation and dissemination. Recent projects incorporating the co-construction approach for technical proposals have shown positive results.

Further reading:

G. Jiménez-Estévez, R. Palma-Behnke, D. Ortiz-Villalba, O. Nuñez, and C. Silva.: "It Takes a Village: Social SCADA and Approaches to Community Engagement in Isolated Microgrids", *IEEE Power and Energy Magazine*, Volume: 12, Issue: 4, pp: 60-69, 2014.

The Canadian Victory Garden

Glenn McKnight

The Canadian Victory Garden Solar Shed project in Oshawa, Canada was completed in the summer of 2016 as a joint effort between IEEE mentors, IEEE University of Ontario Institute of Technology students, IEEE Toronto Special Interest Group on Humanitarian Technology (SIGHT), and the Foundation for Building Sustainable Communities. The project is a US $5000 demonstration project of a 500-Watt Solar System providing power to run pumps, fans, lighting, a mesh network, and a cell phone charging station to an off-grid community garden that provides hundreds of pounds of organic food to local food banks.

"We relied heavily on the IEEE students and IEEE Toronto SIGHT committee members, yet we didn't know how to effectively engage them."

Critical to the success of this project was the cooperation and support of Butch Shadwell, Senior IEEE Member and former chair of the Humanitarian Technology Challenge for Reliable Electricity, who provided critical technical support and guidance to enable the project to be completed. In addition, we need to acknowledge the financial support of the IEEE Power and Energy Society in helping to fund the project.

Our key failure was our inability to involve students and IEEE Toronto SIGHT committee members in Phase Two of the project. As a collaboration with the local IEEE students, we were to work with them to plan and implement the off-grid solution, including fundraising and integrating recommendations from a Phase One brainstorming session. In failing to involve the students in Phase Two of the project, we were left with very few volunteers to erect the structure, assemble the solar system, excavate the water pipes and earth energy system, and install the fans and lighting. We were fortunate that a small number of IEEE members and mentors involved, with the additional help of non-IEEE volunteers, allowed the majority of the project to be completed.

We relied heavily on the IEEE students and IEEE Toronto SIGHT committee members, yet we didn't know how to effectively engage them.

To ensure we do not repeat this mistake, we have engaged the local student branch and its leadership early, to explain our goals and to encourage their involvement in specific projects which match their interests, and we will strive to ensure formal commitments of volunteers.

In addition to our key failure, we learned an important lesson related to the technology of the project. In collaboration with the local Amateur Radio Club, we put in place a cost-effective and reliable mesh network. We discovered after installation, however, that nearby trees blocked a line of sight connection to the amateur radio repeater, and so it was unable to relay data. Here, our commitment moving forward is to secure more local expertise to enable connectivity and ensure future work involves partnership with local providers.

For more information see www.fbsc.org

Open Source Means Being Open

Alfredo Herrera

My goal was to promote the adoption of sharing humanitarian-focused technologies through open-source platforms – a design practice that enables adopters to share know-how in order to make a design the best it can be.

The intent was simple enough: identify an existing design that is needed, more affordable, more accessible, or of better quality than what exists today, and get it into the hands of an NGO that can put it to good use. I selected Amanda DelCore's sustainable, repairable, solar LED headlamp (github.com/SmallTomatoes/Headlamp).

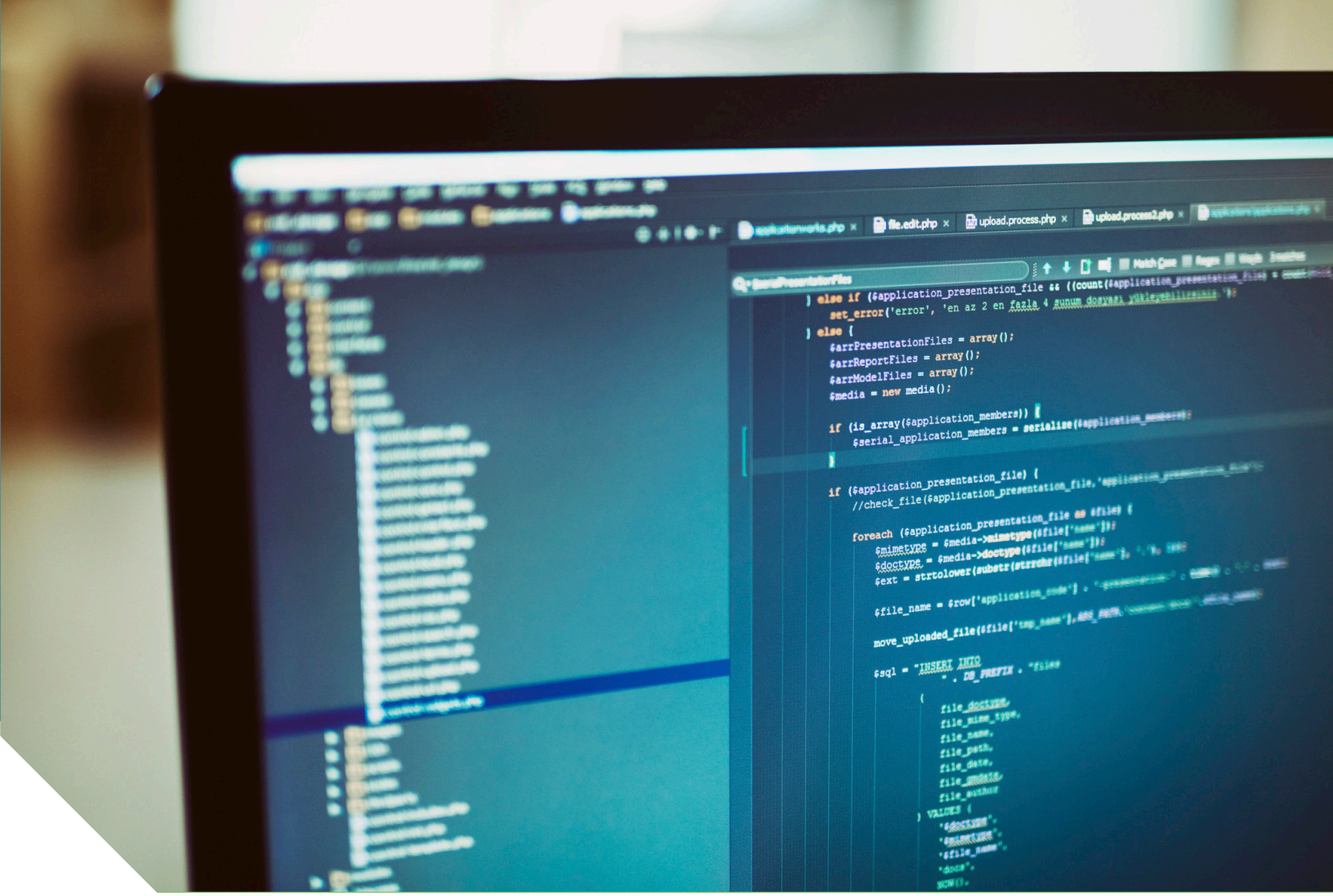
In theory, anyone could build on her design – I just needed to create an IEEE open source repository, put Amanda's design there, encourage IEEE members to put the design to use, get feedback, and use that feedback to continue to make the design better. However… I didn't do that, and the technology (developed in 2011) has yet to be posted to an IEEE open source repository or see widespread use in the field.

My delay in posting the design is a result of seeking perfection in the open-source design and processes. I realize that this is not only unnecessary, it is counter-productive, as it stalled progress to support humanitarian and international development work. I made a number of mistakes, but I have learned from each:

Mistake #1: I assumed that development, aid and non-governmental organizations would welcome IEEE open-source designs. Instead, as I prepared Amanda's design to be shared, the reception from potential users was underwhelming and skeptical.

> *"If I could do this differently, I would share my needs more openly and to a wider audience, enabling me to tackle issues beyond my expertise."*

I focused on preparing the design to perfection, and in doing so, failed to understand the practical wants and needs of aid and development groups. Their limited resources prevent them from piloting every "good idea" that comes along. I should have addressed design shortcomings during the early



design phases by openly sharing the design and working closely with the end-users right from the start.

Mistake #2: I placed too much emphasis on licensing issues. My career has been in private corporations and bound by Intellectual Property Rights and Non-Disclosure Agreements. This experience led me to focus on nailing down legal matters before sharing anything. It took me two years to figure out how IEEE manages legal issues, and four more years to understand how IEEE processes would need to adapt to enable open-source design sharing. Focusing on the licensing, and failing to seek out others with more expertise prevented me from getting help from experienced IEEE volunteers and staff. If I could do this differently, I would share my needs more openly and to a wider audience, enabling me to tackle issues beyond my expertise.

In the end, I volunteered to do something I had never done before: enabling IEEE volunteers to share designs in an open source, on-line platform for agencies and NGOs. The main lesson I learned is that my fear of making a mistake caused me to invest too much time in legal matters and the design release processes, when I should have just posted the design and built a community around those interested in helping. Going forward, I plan to face my fear of not being perfect and embrace openness as a means to act and do the right thing.

Further reading:

A. DelCore and A. Herrera, "Sustainable solar headlamp: An open source consumer medical device," *2015 IEEE International Conference on Consumer Electronics (ICCE)*, Las Vegas, NV, 2015, pp. 395-397.

A. Herrera, V. Groza, D. Wright, "Open Source Hardware for Human Development," Université d'Ottawa/University of Ottawa, 2015.

When Sustainability Is Elusive: The Case of the Lighting Project

Satish Babu

In 2010 and 2011, IEEE Kerala Section took up a project to provide off-grid lighting to Karukone: a small, isolated community located within a forested area. The community, consisting of eight houses, was over two kilometers away from the nearest grid access point. Their request was forwarded to a local engineering college by the electric company who refused to provide them grid connectivity based on cost.

The IEEE Student Branch at the college, alongside IEEE Kerala Section, surveyed the community and designed a solution based on solar power. In order to provide two eleven-Watt compact fluorescent lamps for each of the eight houses, one 60 ampere-hour battery, two 80 Watt, 24-Volt solar panels, and an inverter were required. Each house was wired with two points and an isolator, and houses were connected with an underground cable. The solar panels were mounted on the roof of one of the houses, and the output from the inverter was provided to another five (the other three homes used direct current lighting). Residents were provided with training on how to operate the inverter and IEEE student volunteers from several Student Branches conducted all the work.

With funding from IEEE microgrants, 46 student and staff volunteers implemented the project with much enthusiasm. Although there were a few unforeseen delays, the level of motivation among the volunteers and beneficiaries was very high. The local Panchayat (government organization) also supported the initiative. The entire leadership of IEEE Kerala Section was present for the project inauguration in February 2011.

Several months after commissioning, all was not well with the project:

We discovered that the residents wanted power for their TVs and fans, not just two lamps. Providing power for TVs was considered early in the design phase, but was rejected as the power demand would rise several fold. The villagers claimed that without TVs and fans, the whole initiative was not worth the trouble. The project team feared a slippery slope, as the residents may ask for power for kitchen appliances next.

It turned out that the community of eight houses had significant social dynamics: although they were related to each other, they were not necessarily on talking terms. The owner of the house where the panels were mounted assumed the role of 'owner' of the unit, and would not allow others to operate the main switch. This led to altercations with some homeowners, and others reverted to pre-project conditions.

The maintenance of the unit (particularly the battery) during and beyond the warranty period ran into problems, with the Panchayat withdrawing

"We learned that what appear to be technology projects are rarely about technology alone."

its support. Routine maintenance, which required significant travel, was discontinued. The lack of use and poor routine maintenance led the equipment to fall into disuse.

Follow-up visits by volunteers was made quite difficult because of the remoteness of the location – a whole day from Kerala Section's Head Quarters.

A project's sustainability depends on the success of technological, social, economic, institutional/ political, legal, ecological, and gender factors – and there are secondary and tertiary factors arising out of the interplay of these with stakeholders. In this case, we perhaps went wrong in focusing on the technology, and not recognizing the other aspects.

We learned that what appear to be technology projects are rarely about technology alone. In this particular case, social, institutional, and economic aspects were as important as technology, and the sustainability of the project was compromised because the project team assumed a straightforward approach to solving the 'problem'.

Despite the best efforts of volunteers, it is not easy to foresee all the complexities that may arise in the field. It is important, therefore, to create institutional memory that helps in predicting such issues.

Kerala Section has run several successful projects before and after this lighting project. However, despite the problems faced, it is this project that has provided us with the most valuable learning. Having grown through the experience, Kerala Section is now particularly sensitive to overall context in our projects, and the different aspects of sustainability. In particular, we believe our ability to design, conceptualize, run, and evaluate projects has significantly improved after this experience.

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Contact Info

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