



Cerbumi.org¹: A Pilot Feasibility Study

Developing an open-source network approach to real-world problem solving

I. Vision

We can apply lessons learned and tools developed in the open source movement to solve real-world problems. A website that linked stakeholders, nonprofit organizations, volunteers, and donors would create a powerful forum for identifying problems, brainstorming, solving, funding, and implementing solutions.

II. Background

Strong parallels exist between software development and the work of nonprofits. A piece of software is fundamentally a solution for a problem: it provides a structured means to complete a task. For example, one could say Microsoft® Word® solves the problem of word processing. Many new applications are solutions to problems that nobody had ever heard of. Apple's iMovie, for example, brought desktop video editing to ordinary consumers who never knew they "needed" it. Other applications, like iTunes, seek to handle a task more efficiently or with better results than the existing offerings. Fundamentally, writing software is a continuous exercise in problem solving. Nonprofits solve social problems.

Successful software development requires substantial financial and structural resources. Human capital and creativity drive the writing of applications. Robust feedback loops ensure that the software meets the needs of end-users. A capacity to recycle previous efforts efficiently reduces work. "Classical" software development projects frequently lack these resources, and many well-meaning software projects are unsuccessful. Similarly, many nonprofits report that they suffer from insufficient resources, limited access to experts, limited feedback from stakeholders, inefficiency, limited knowledge sharing, and a bureaucratic culture.

Source code is the original computer code used to create and change a software application. Under classical software development, the developer holds the source code as a critical trade secret. This protects rights but limits society's access to human capital—hardly a collaborative process. In this scenario, software development is a chore, not a service.

Like social entrepreneurs, software developers are extremely creative. They derive motivation not only from their wages, but also the process of creating elegant solutions to problems. Frustrated with the limitations of "classical" software development, programmers have created the *open source methodology*. According to the Open Source Initiative, a nonprofit corporation "dedicated to managing and promoting the Open Source Definition,"

¹ *Cerbumi* is an Esperanto word that means 'brainstorm.' In this document, Cerbumi.org is a reference to the site, while *cerbumi* is a reference to the concept.

The basic idea behind open source is very simple: When programmers can read, redistribute, and modify the source code for a piece of software, the software evolves. People improve it, people adapt it, people fix bugs. And this can happen at a speed that, if one is used to the slow pace of conventional software development, seems astonishing.

The open source methodology has transformed software development and the computing industry. It provides three crucial advantages:

First, it capitalizes on a new communications infrastructure to create a robust collaborative environment. As Rothfuss suggests in his thesis “A Framework for Open Source Projects,” the worldwide adoption of rapid-fire advances in communication technology have given birth to immense collaborative effort, with remarkable results. At the same time, the open source culture made working on open source projects fashionable. This environment encourages rapid software development, enables younger programmers to meet and learn from mentors, and facilitates communication between the end users and developers. Thus, a software developer with a novel idea but limited resources of time and money can attract other developers to work with her. This synergy enriches the project and makes novel solutions possible.

Second, there is no compromise in quality. In fact, the software produced is at least as good as software produced through the classical method. Linux and Apache epitomize the efficacy of the open source methodology via the Internet as a method for research and development. Linux, a world-class operating system, competes robustly with Windows for many business applications. Apache, a web serving application, powers 67% of websites on the Internet.

Third, because user feedback is integral to the development process, the software is much more responsive to the end-user’s needs. Furthermore, since the source code is publicly “owned,” users can modify the software themselves to meet their own requirements and then share their modifications with other users who may find them useful. Thus, rather than an afterthought, end-user (stakeholder) participation is integral to the creative process.

The advantages demonstrated in open source software could be adapted to enable new approaches to problem solving in many sectors. Cerbumi.org will apply these open-source lessons to the nonprofit sector. It offers the same three advantages over conventional problem solving.

First, the *cerbumi* environment offers nonprofits access to experts that would not otherwise be available. Just as a small software developer can get help writing software, so too can nonprofit access problem-solving resources. At the same time, Cerbumi.org gives experts access to problems, turning them into stakeholders. It presents experts with opportunities and invites them to join a team.

Second, we cannot conventionally fund answers for the myriad of opportunities to improve quality of life. Therefore, we need solutions that are just as good but cheaper. The best solutions aren't always high-tech, For example, in 2002, the World Health Organization recorded 124,000 cases of cholera and 3,800 related deaths. The simple act of filtering water

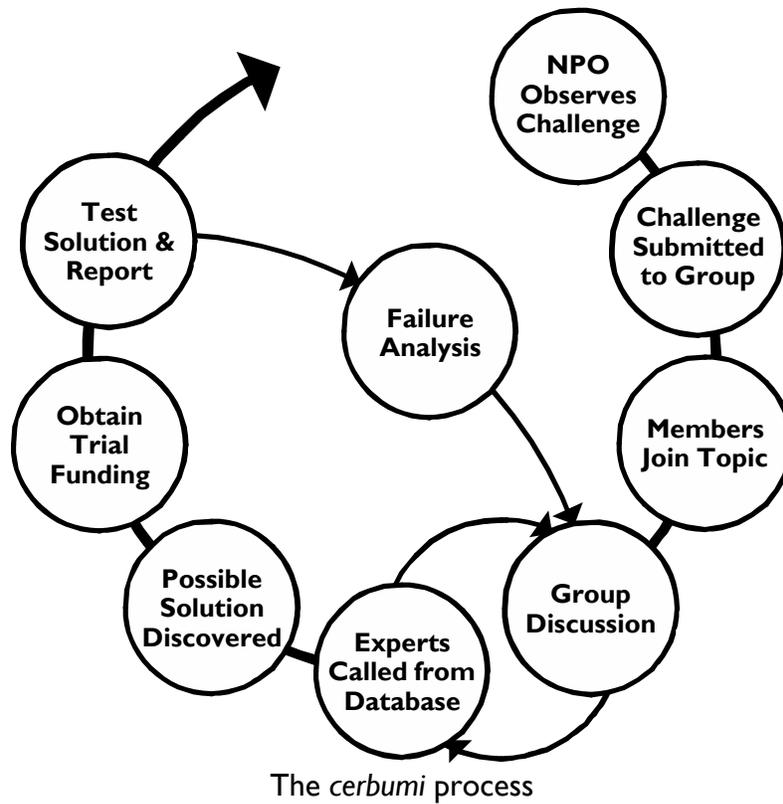
through sari cloth could have prevented half of these cases. In fact, the sari cloth filter worked better than a more expensive conventional nylon filter.

Finally, the *cerbumi* process is inherently open. Each step of the *cerbumi* process is free and transparent to any interested party. This ensures that solutions found remain in the public domain. It also creates a searchable knowledge database, useful to other nonprofits seeking solutions to similar problems.

III. Nine steps to solve a problem

A recent *New York Times* editorial described how farmers in Zimbabwe discovered a novel way of preventing elephants from destroying their crops. With the help of a \$108,000 grant from the World Bank, they now plant chili peppers around their fields. The elephants find the smell noxious and avoid the crops. The farmers enjoy both a protected field and a new cash crop. The result is an inexpensive, low-tech, and elegant solution to a genuine problem that affected farmers on a regular basis.

The *cerbumi* process and contributing infrastructure is our proposal for utilizing some of the lessons learned in the open source movement to create appropriate solutions for real-world problems. Let us use the elephants and the chili peppers example to illustrate how it could make a difference:



1. A nonprofit organization observes a challenge.

A nonprofit organization, such as the Peace Corps, observes a challenge in the field. They document the nature of the problem.

In our example, an aid agency observes farmers “warring” with a herd of elephants. They learn that this drains substantial resources that would best be devoted elsewhere, and that the problem is common in the region. The agency documents current approaches to the problem and reports on their effectiveness. Suppose the problem affects about 10,000 people in the region. Prior efforts have included armed patrols or moats, both of which are costly and ineffective.

2. The challenge is submitted to Cerbumi.org.

The nonprofit summarizes their findings and present a case for assistance by sending an email to the general mailing list. A Cerbumi.org moderator (initially an administrator, but later a volunteer) verifies the message and forwards it to the email list that reaches all Cerbumi.org members. Members query if the project is suitable for Cerbumi.org:

- **Severity:** What is the severity of the problem? Is it a nuisance or a significant problem? Is finding a solution worth the effort?
- **Difficulty:** Is there likely to be a simple solution, or will this problem require substantial resources and effort?
- **History:** How long has this been a problem? Are we planning to fix a symptom or the root cause?
- **Locality:** Is the problem specific to one area or village? How significantly can we improve quality of life around the globe if we solve this problem?

If suitable, a representative of the nonprofit or an interested Cerbumi.org member starts a challenge topic. The member categorizes the challenge topic by specialty and geography and presents the complete findings of the nonprofit. This step alone serves to create awareness of an issue, which has marked benefits (in and of itself).

In our example, the aid agency visits Cerbumi.org and presents an abstract to the general email list. Hundreds of people receive the abstract, and a few interested volunteers add the challenge topic to Cerbumi.org’s listing of challenges as agricultural in nature, generally affecting southern Africa. The agency’s findings are fully disclosed. Nature, scope, and severity are clearly documented.

3. Members join the challenge topic.

Interested members will find the challenge topic on the Cerbumi.org website or through moderated emails that highlight new topics and successes. These members are volunteers or members of interested nonprofits or donor agencies.

Now that the elephant topic has been created and “advertised,” volunteers join the topic. Their names or aliases are added to a roster of participating members and to the topic mailing list. Other nonprofits join the topic to observe possible solutions to related problems they may be facing. Donors interested in southern African affairs join to support new opportunities.

4. Members of the group discuss the challenge.

Via an online forum or enhanced mailing list, the group begins to discuss the challenge and consider possible sources of solutions. To supplement the discussion, members may circulate drawings, photographs, and papers on the Cerbumi.org website. During this discussion, a group moderator regularly summarizes the current discussion and maintains the challenge's website to keep the group and other interested parties up to speed.

Our group begins brainstorming on the elephants. Are there too many elephants? Can we feed the elephants something else? What is wrong with current prevention techniques? Why don't moats work? Can we build a better moat? What similar problems have we already encountered? In the United States, gardeners plant marigolds to repel deer. Will marigolds have any effect on elephants? If not, what else will?

5. The group calls experts from the database to help.

Volunteers provide a listing of their skills and competencies for a member database when they join Cerbumi.org. When a challenge discussion requires knowledge or a skill that nobody in the group has, the group can turn to the member database and find experts. Experts may become intrigued in the group's work and join the discussion, or they may simply answer a few questions.

Our group likes the marigolds idea. But will elephants like marigolds? A veterinarian or zoologist might know. They learn that chili peppers, cacti, and tumbleweed all deter elephants. The group asks a botanist if these plants will crowd out existing plant species or are the appropriate plant for the area. The group identifies chili peppers as providing the best benefits with minimal risk, and return to the discussion.

6. The group discovers, tempers, and publishes a possible solution.

After several cycles of brainstorming, questioning experts, and discussion, the group will eventually find at least one plausible solution. They temper it by considering and resolving possible sources of failure—the group should dissect overly simplistic solutions. They explain, with expert backing, why their solution will work, and how much it will cost to implement. The group may conduct limited pilots to test core assumptions. Finally, they publish their findings and suggestions on the Cerbumi.org website. This creates prior art, a possible source of protection against future patent abuse.

Our group has settled on the chili peppers approach. They have investigated the financial, cultural, natural, and legal ramifications of their solution and found no obvious problems. The group moderator documents their discoveries, including: the nature of the problem from step 1, key highlights from steps 4 and 5, and the reasons why their solution will work.

7. The group obtains trial funding.

This may be an optional step depending on the circumstances. Given the wide variety of projects clamoring for financial assistance, perceptive donors look to fund results—not effort. Thankfully, volunteers have already donated most of the “effort” necessary to develop a solution. Potential donors now see solutions—results—with substantial community backing, and need only fund a trial implementation. The nonprofit who started the cerbumi could simply return to their usual funding sources. Additionally, Cerbumi.org could provide a listing of projects that have a consensus for a solution but no trial funding.

Our group approaches the various donor groups on the Cerbumi.org database that have expressed an interest in this field or region. With luck, their idea will compel donors to fund a trial.

8. The group tests the solution and reports.

Now that the group has received a commitment from donors, they can work with local groups to test an idea. In many cases, the nonprofit that documented the problem will also work to implement its solution.

With funding from a major agricultural interest, an local aid agency works with farmers to test the use of chili peppers to deter elephants.

9. The group analyzes the success or failure of the tested solution.

After testing the solution, we will learn the realities of its effectiveness. The solution could be extremely effective, leading to Cerbumi.org suggesting its use elsewhere. Unforeseen complexities could hamper the solution’s effectiveness. In many cases, it would be appropriate to provide feedback to the project group and modify the solution accordingly. Ultimately, a failure may be as helpful as a success if it can provide substantial information.

Our farmers test the chili peppers and discover that this particular species does not thrive well in their soil. Alternatively, in a worst-case scenario, the wrong chili pepper species could be too successful and overwhelm nearby native species. The implementing agency returns the results to the group along with additional data (perhaps a soil sample). With additional help of experts, our group discovers an appropriate species and the idea is tested again.

IV. What Cerbumi.org offers to participants

To nonprofits, Cerbumi.org offers visibility, access to potential solutions, and “brainpower.” This may also assist in matching good solutions with interested funders.

To volunteers, Cerbumi.org offers a unique way of making a real difference, without even losing the comforts of home. It provides the camaraderie of participation in a team, and the satisfaction of seeing the results of one’s expertise and contributions. In addition, the experience offers valuable problem solving and communication skills that could prove invaluable if applied elsewhere.

To employers of volunteers, Cerbumi.org provides critical problem solving and communication training to employees by their participation and observation of the *cerbumi* process. It also trains employees how to work effectively on problem solving over the Internet, useful in an age where firms employ knowledge workers all over the world.

To donors, Cerbumi.org provides a way of contributing directly to projects that have a strong chance of results. Ideal Cerbumi.org solutions are readily tested.

V. Pilot feasibility program

It is our goal to provide a proof-of-concept demonstration that we can implement the *cerbumi* process and develop helpful solutions to a selection of trial challenges.

We ran an advertisement in an online community of over 30,000 members, seeking volunteers for a study that analyzed how people work together on the Internet to solve problems. The primary demographic is young men from age 16 to 25, but the well-moderated community includes representatives from every group. We ran three study cycles. For the first two cycles, we solicited a limited number of participants and conducted the trial on a private mailing list. For the third cycle, we publicly conducted the study on the community's bulletin board system. We presented the first and second groups with complex math-related puzzles, who found solutions in a few hours. Based on this success, we offered this challenge to the second and third study groups:

Refugees require housing that can be drop-shipped from around the world to wherever they are: local building materials are often unavailable, and time is short.

Can you devise a small shelter, about 10'x10' with about a 6-7' roof, that is easy to assemble, and that should cost about \$100 or less in any real quantities? It should be lightweight, weatherproof, and reasonably portable; if the refugee can't take their shelters with them, they probably won't leave. Insulation and durability is a good thing, too. How good of a product can you design? Keep going until you agree that what you have provides the maximum benefit for the lowest cost.

The discussions ultimately fell apart. Some possible reasons for the failure include an inappropriate or poorly framed question, a lack of experts in the group, a lack of discussion guidance, and poor tools. However, their wholehearted willingness to participate suggests that volunteers who will take a problem seriously can work effectively with the right framework. For example, the same community raised nearly \$21,000 to provide a member's army platoon with personal armor plates for their tour in Iraq.

At this point, we believe that the *cerbumi* process shows substantial promise. We would like to begin a two-phase feasibility study that would first create the core components of the Cerbumi.org infrastructure, then test the process on one to three real world problems. Each phase will require approximately 6 months:

We will recruit participants early in the process. They will prove to be invaluable by providing feedback for the design of the application, marketing to nonprofits, and identifying opportunities. We can recruit from a variety of sources including professional societies, personal contacts, communities on the Internet (such as Slashdot.org and SourceForge.net), and colleges. Large organizations may contact their employees on behalf of Cerbumi.org. We hope to find publicity through articles in newspapers and radio stations. We will also consider advertising on National Public Radio as the project grows.

Identifying problems

As we begin our discussions with nonprofits, we will learn of dozens of opportunities for the *cerbumi* process to make a difference. We will solicit opportunities broadly but quickly narrow our focus to a few problems that would provide the best test. The purpose is two-fold. First, it will help to expand the Cerbumi.org user base. Second, it will serve to create a broad cross-section of the types of problems the *cerbumi* process might encounter. This will both strengthen the software infrastructure and demonstrate the widespread implications of the framework.

Develop and quantifying a problem for the pilot

From our selection of challenges, we will select the challenge that would best test the *cerbumi* process. We are not particularly interested in finding a problem that will be *easy* to solve given our resources. Rather, we wish to identify the problem that is most likely to give the most robust test of the framework. An ideal problem is specific, limited in scope, relatively concrete (like the shelter), and general enough in subject matter to be amenable to multidisciplinary collaborative problem solving.

Run the *cerbumi* discussion process

After selecting and qualifying the challenge we then run the *cerbumi* process listed above, starting with step 4. During this time, we will log all discussions and feedback.

Assess the process and results

After running the *cerbumi* process, we will solicit feedback from the participants. We are primarily interested in the ways in which we can improve the process. For instance, we may learn of limitations or complexities of Cerbumi.org that make it difficult for the average computer user to contribute effectively.

Assist the nonprofit in funding appropriate solutions

Once we find a solution worth implementing, Cerbumi.org could assist the nonprofit in implementing it. For instance, we would summarize the group's findings, extract expert consensus, and present the results to donor agencies.

Report to the pilot's funding agency on results and feasibility

At the completion of the pilot, we will document the results of the project and the feasibility of continuing.

VI. Pilot goals and deliverables

Goals

- Create an infrastructure that is accessible to a broad array of end-users.
- Recruit a substantial base of volunteers
- Generate testable solutions to real-world problems

Deliverables

- Testable solutions to at least one real-world problem.
- A report documenting the success of the pilot.

VII. Necessary resources

The *cerbumi* pilot will need substantial resources to be successful. First, Cerbumi.org is an environment for open collaborative design that links nonprofits, volunteers, and donors. It cannot succeed without a sufficient number of each type of “actor:”

- Mentors to guide the creation of Cerbumi.org
- Nonprofits identify problems and implement solutions
- Experts in a variety of fields
- Volunteers donate their time to brainstorm, provide skilled advice, and maintain the site
- Donors provide the necessary capital to test solutions, an optional but elegant solution

Cerbumi.org also needs financial backing to build the collaborative environment and guide projects. Each phase brings its expenses. We have prorated expenses for the duration of the phase.

Description and justification	Phase I	Phase II
Linux-powered server <i>A separate Linux-powered machine ensures greater scalability, security, and flexibility. It is also substantially cheaper than using a Windows-based platform.</i>	\$750	-
Collocated Internet hosting, 6 months at \$75/mo <i>Using a dedicated server requires a connection to the Internet through a collocation facility.</i>	\$450	\$450
Programming services, \$25/hr <i>Building and upgrading Cerbumi.org quickly will require the effort of paid programmers.</i>	\$4,000	\$1000

Project management, \$30/hr <i>Creating documentation, recruiting board, managing new volunteers, promoting the project.</i>	\$7,800	\$7,800
General supplies	\$500	\$500
Phone costs	\$200	\$200
Networking hardware and general IT support for key staff <i>In-kind contribution valued at \$600/phase</i>	-	-
Totals:	\$13,700	\$9,950

VIII. Summary

In short, there is substantial evidence from the software industry demonstrating the remarkable capability of open source software projects. The environment of open source software development is similar enough to that of nonprofits to suggest that many of the tools useful in one sector will likewise be useful in the other.

IX. Future directions

Depending on the success of the pilot, we have a few possible scenarios for Cerbumi.org. Given a completely successful pilot, we will seek additional funding to expand the project further. We may run additional trials with the same volunteers and nonprofits to refine the process. Or, we may recruit additional experts to develop the idea further. Ultimately, we realistically hope to find a combination of the three scenarios: a successful pilot with an infrastructure able to adapt to the identified needs of all participants.