Appendices

A: Project Charter
B: Defining Statements
C: Function Structure
D: Design Factors
E: Information Structure
F: Sample Working Forms

2 each of the following:
- Activity Analyses
- Solution Elements
- Means/Ends Analysis
- Ends/Means Analysis
- System Element - Function Matrix
- System Element Relationships
- System Elements
A: NSI Charter
Institute of Design
Illinois Institute of Technology

Design Thinking
A Natural Systems Institute

Charter

Background
In the 1980’s, with the first comprehensive gathering of data on global warming, tangible effects of population growth began to be firmly associated with the actions of industrial society. Meeting the demands of a growing population for material goods was beginning to be seen as a two-way street. The concept of a "better life" was beginning to look like a relative one—briefly better, relative to the past, but frighteningly better, relative to a very uncertain future.

Because few listened when something might have been done about it, we are now confronted with global warming as an observable, highly threatening fact. Like many other massive events, it took a long time to gain strength, and it will take longer to lose it. It is still in a strengthening pattern, and it is hard to see how that will change in the foreseeable future.

In spite of world-wide awareness, population growth also is still in an accelerating phase. The population of the world is now 6.46 billion and rising. Just 50 years ago it was 2.76 billion. Despite the fact that almost all developed nations are at replacement-level birth rates—or lower—world population is still on a steep incline because of high birth rates in developing countries. Before world population begins to level off, we can expect to see the number rise to over 10 billion—barring catastrophic events.

And catastrophic events are distinct possibilities, growing in probability every year, all because of population growth. A better life for a growing population—even eliminating poverty, as the September 2005 issue of Scientific American argues as a goal—means more energy to be produced and more resources to be processed. Without sustainability, this can only mean unchecked resource depletion and uncontrolled greenhouse gas emissions. Both will generate disasters at an accelerating rate.

Global population growth and the problems it has induced—from resource depletion to global warming—are arguably the most serious threats ever to our civilization. But as we finally commit to confronting them, technologies now just evolving will put awesome new capabilities at our disposal. We may yet be able to escape the worst ravages, perhaps even bring better quality of life to our descendents. The question is, will our political decision makers have the wisdom to avail themselves of the right tools at the right time? Will we be able to avoid the worst of projected disasters and make best use of the new technologies? Decision makers will need the best of creative thinking from the science community—and from a design community prepared to contribute.

The evidence is that decision makers are not using—or receiving—the full range of advice they need. Advice that offers proactive, constructive, creative options for action is not being heard. The design community must assume new responsibilities and reinvent itself to fill this void. In so doing, it will have to rethink matters of education, research and professional activity, and it will have to prove to leaders that design thinking is a critically valuable asset.
Relevant Trends

Trends initiated by emerging technologies, changing environmental conditions, and evolving social change will have real impact on the situation. Among such trends are:

**Food Production on Land**
Food production for a growing population is an absolute requirement. In the last 50+ years, beginning with the green revolution that virtually saved India from starvation, the rise in food production has outstripped population growth. But arable land per capita continues to decrease—by 2050, it will have decreased over 62% since the 1960’s—and productivity cannot increase indefinitely.

**Food Production at Sea**
The oceans, once thought to be a limitless food source, are fast becoming a depleted resource. Stocks of wild finfish and shellfish are declining alarmingly. The fishing industry is turning more and more to deep-water species to replace them, often with little knowledge of the biology of the replacement species.

**Water Resources**
Already in many parts of the world, water supplies are reaching levels of insufficiency. Complicated by agricultural needs for irrigation and the needs of urban centers becoming megacities, the fresh water resources of our lakes, rivers and subsurface aquifers are subsiding. In 2003, 9,500 children were dying daily from insufficient or contaminated water supplies. One-third of the world’s population, by some experts’ analysis, live in water-stressed countries now, with two-thirds of the world to share their dilemma by 2050.

**Mineral Resources**
Mineral resources are approaching finite limits, exhausted in some locations, more difficult to extract in others. While supplies of some minerals are in no immediate danger, others are under severe pressure. Oil is a resource of vital concern, with production expected to peak in this decade or shortly thereafter. The Hubbert Curve, long-used as a predictive tool in the petroleum industry, when coupled with modern corrective tools, predicts that we are reaching worldwide peak production now and face a reduction in production of approximately 3% per year very soon. Not only will that oil production have to be replaced as an energy source, additional energy sources will have to be found to keep pace with the population curve.

**Population Movement**
In an interesting paradox, the countryside is becoming less—not more—inhabited as we add to the population. The people are moving from the country to the cities. As of this year, 2005, the world is more urban than rural for the first time. In the next fifteen years 300 million rural Chinese will move to the cities. In 1950, only two cities in the world, Tokyo and New York City, were over 10 million in size. By 1975 there were 4 such megacities, and by 2003, there were 20. By 2015 there will be at least 22. In China alone there are between 100 and 160 cities with over 1 million inhabitants (America has 9, and Eastern and Western Europe together have 36). Cities are complex, sophisticated systems, but their managers will need all the skill they can command to deal with the great urban migration.

**Climate Change**
Climate and weather patterns are changing. Some regions are simply getting drier or wetter, but the greatest damage will come from sustained, severe droughts and intense, prolonged flooding. The problem is change: eco-systems confronted with wetter or drier conditions for periods far longer than the environment or its inhabitants are prepared.
**Rising Ocean Levels**
Ocean levels are rising. Temperature rise under global warming is greatest at the poles, and polar melting is accelerating. Melting icebergs have little effect on rising water levels because the ice is already floating, but ice melting on land, such as in Greenland and Antarctica, will contribute to rising water levels, and the thermal expansion of water as it is heated a degree at a time will also contribute. The Intergovernmental Panel on Climate Change in its 2001 report, estimates a 45 cm (18 inch) mean rise by the end of the century with a low estimate of 9 cm (3.5 inches) and a high estimate of 88 cm (35 inches). Many of the world’s major cities are on ocean coasts or waterways close to the oceans.

**Storm Violence**
The increased heat energy created by global warming is feeding more violent storms. Storms over the water will increase in number and in violence. Storms over land, although less subject to the stimulation of ocean heat, will draw from the weather systems that build over the oceans and move readily onto land. All but the regions most remote from the coasts will be influenced. Category 4 and 5 levels can be expected increasingly for hurricanes, cyclones, typhoons and tornados.

**Moving Ecological Zones**
On a longer scale, climate changes are moving the zones in which species can live. Warmer winters, earlier springs and hotter summers are changing key environmental characteristics crucial for species’ survival, even existence; and as ecological zones migrate northward (or southward in the southern hemisphere), they will do so at a pace too fast for plant species to follow. When species disappear, others dependent on them are also affected, and eco-systems disintegrate. Biodiversity will decrease and extinctions will take place.

**Increasing Expectations**
The growing availability and capabilities of communications such as cellular telephones, satellite and cable TV, and the Internet across the country (and the world) are providing people with daily knowledge of living conditions, problems, products, threats and services everywhere. The media are creating growing avenues for fast communication between protectors and populace. They are also educating the populace on the state of conditions and creating expectations that both fuel demand and create willingness to change.

**Internet Penetration**
Computer use and Internet access grow exponentially every year. Information of encyclopedic detail can be obtained more and more easily, and complex, sophisticated processes can be used remotely. Access to high-quality communications and sophisticated computer tools are increasingly available to individuals and groups anywhere. In the United States, Internet penetration has reached 67%.

**Emerging Technologies**
The pace of technological change continues to accelerate, bringing new science to commercial, institutional and industrial uses at an ever quickening pace. Most notable among many fields, major technological innovations can be expected in the new disciplines of molecular nanotechnology, robotics and the biosciences.

**New Relationships**
Greater public mobility and access to information is changing the nature of association for many individuals and organizations. Organizations that once operated in isolation are now players in a common environment. Sometimes the emerging relationships are competitive, sometimes cooperative. New forms of relationship can be expected and created as conditions evolve.
**Project Statement**  
Using Structured Planning methodology, develop a proposal for a Natural Systems Institute as a 21st century evolutionary response of zoos, aquaria, conservatories and other specialized institutions to the realities of global warming and growing human population pressure on the environment. The proposal should:  
1. integrate formerly separated fields into an ecologically based, whole-systems approach to the study, exposition and preservation of nature.  
2. extend mandates for public education, community involvement, and active participation in the monitoring and maintenance of the environment.  
3. network institutes into national, regional and global systems responding to the natural ranges of plants and animals.

**Goals**  
*As general guidelines a proposal for a Natural Systems Institute should:*  
- Explore a full range of possibilities, paying especial attention to appropriate technologies and user needs.  
- Consider both high- and low-tech concepts as they are appropriate.  
- Include ideas for content, form and structure—including procedures, policies, events, activities, organizational concepts and relevant relationships.  
- Explore revolutionary as well as evolutionary ideas.  
- Consider the educational process through which individuals and groups learn to participate in the Institute and use its resources.  
- Accommodate all users of the system, from implementation to adaptations and provide for them in the design. Thoroughness is a step toward system integrity.  
- Consider potential costs and funding thoughtfully; the proposal should not incorporate unnecessary frills, but it should not sacrifice effectiveness for low cost.  
- Treat the design problem as design from the inside out; users’ operational needs come first, with every attempt possible made to satisfy them in some way, even when tough design decisions must be made.  
- Conceive the properties and features of the Institute and its operations as means to build trust and cooperation with the community and complementary institutions.  
- Consider the project as one component of four demonstrating advanced design thinking and showing how it can be extended to decision making at the policy planning level.  

*Overall, the solution should:*  
- Assume that the proposal can be acted upon as it is conceived. Do not underpropose on the assumption that a concept might be politically opposed.  
- Demonstrate what might be achieved. The value of the proposal is in its ideas, not its certain attainability. Ideas that might not be fully attainable under today’s conditions may be incrementally achieved tomorrow—*if they are known.*

**Resources**  
Resources for the project will be:  
**Physical:**  
- The facilities of the Institute of Design, including Room 514 as general meeting space at the beginning of each class session, and 5th floor for team activities.  
- Computing support from the fifth floor computer facilities.  
- Equipment as necessary from ID resources.
The project will be conducted from August 30 to December 9, 2005.

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<th>Activity</th>
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<td>Introduction</td>
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<td>Sep 2</td>
<td>Project Definition</td>
<td>Develop Issues &amp; Defining Statements</td>
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**Methodology**


**Issues**

Consider the following topics as initial issues to be investigated. Supplement them with additional issues as information is developed during the first phase of the project.

*Technology*. What approach should be taken toward the incorporation of available and emerging technologies?

*Adaptivity*. How should elements of the system respond to evolving social, political, technological and environmental conditions?

*Partnerships*. What approach should be taken toward partnering with governmental/institutional organizations, suppliers of funding, educational institutions, etc.?

*Time of Introduction*. When should the system be ready for implementation?

*Means of Introduction*. How should the system be introduced to facilitate acceptance and implementation?

*Inter-institutional Relationships*. How should relationships with other potentially competing or cooperating organizations be developed?
Cost. How should costs and funding of the system and its operations be approached?

Geographic Concentration. How narrowly or broadly should the Institute direct its ecological focus—local, regional, continental, worldwide?

Mission. What should the balance be among research, public education, environmental stewardship, species preservation, advocacy and other possible roles?

Involvement. How active should involvement be in the observation, maintenance, management and restoration of environment and ecosystems?
B: Defining Statements
<table>
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<tr>
<th>Defining Statement</th>
<th>Issue</th>
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<tbody>
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<td><strong>Project</strong></td>
<td>Adaptivity</td>
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<tr>
<td><strong>Question at Issue</strong></td>
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<tr>
<td>Adaptivity: How should elements of the system respond to evolving social, political, technological, and environmental conditions?</td>
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<td><strong>Originator</strong></td>
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<td>Mark King</td>
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<td><strong>Contributors</strong></td>
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<td>Alternative Position</td>
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<td>Team deliberations</td>
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<td><strong>Background and Arguments</strong></td>
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<td>Environmental conditions are declining rapidly, in reaction to the increase of human populations, the rise of technology, and governments’ ability (or inability) to react accordingly. Since the NSI intends to defend the world’s natural environment, it will be necessary to address these issues, and even use them to its advantage in predicting trends. Current systems of species preservation, such as zoos, aquariums, etc. are primarily reactive, educating their audiences of the plight of exotic animals and how to save their endangered numbers. This has been the traditional way of species preservation, as zoos were founded to preserve the Siberian Tiger or the African Elephant, confining them to cramped quarters, controlling their breeding, and putting them on display for the public as a reaction to their declining numbers. The research into renewable sources of energy is a somewhat successful (and ongoing) plan of anticipating a crisis before it happens. Although not widespread, the use of renewable resources is currently being employed, including wind, solar, hydroelectric, geothermal, hydrogen fuel, etc. before the non-renewable resources are completely depleted.</td>
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<td>As situations worsen, with less habitable land, global warming, the increased global market, etc. any preservation model must be able to anticipate what trends are occurring worldwide, even if the focus is local. Soon, there will be no more habitat for the tiger (and many other species of plant and animal), so the NSI must provide one, resembling its natural habitat as closely as possible.</td>
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By the report 'World Day to Combat Desertification', now desertification expands worldwide up to 40 percent of overall surface of the world. By the scientist citation, the largest dry land already grew from Saharan Africa across the Middle East and Central Asia into parts of China. This dry land, ranged from dry sub-humid to hyper arid, would be result unsuitable farming to the poorest population area. Although desertification problem is emerging as local scale problem but it impacts the world food poverty that is a global scale.

As far as the problem always happen all the time in each area. Natural system is a combination of the whole pieces because each issue can link to others. To concern just one or two problems may not solve the problem successfully. To zoom out, the institution should examine problems in a whole system and determine the most critical area. Moreover, the institution can concentrate to the methodology level in each scale.

On Implementation stage, the institute should start studying in various local areas depending on critical situation in global scale. To zoom in, the institution should study in the details of each factor that cause problem to get more insight and clearly vision. Moreover process to solve the problems step by step might be easier to control for institution.

In conclusion, the institute should concentrate in both global scale to concern the linkage between each issue, and local scale to study and understand depth of issue through details.
The Natural System Institute has the mission to educate, exhibit, and research animal. By research, the main capital of existing of similar organizations came from government or personal capital. They also earn from donation from the community, the admission gate, the gift shop, and books. However, they are using lots of money in the animal care problems, ecosystem control, personnel policy, governance and maintenance. It is obvious that the investment with this project hardly profit lots of money. For this reason, the cost may not directly deal with whole problem of global warming.

Therefore, the main source of the funding for this project should be support by community or cooperation between government and community at first. And then the Institute should manage this capital by funding organization as a temporary fund to the each Institute. The initial fund should be used as a main capital to run on the revenue stream. Moreover, Funding can be sponsered by the linkage business such as the animal food industry or other organization that can indirectly take benefit from the institute such as animal magazine, science organization.

Therefore, the capital of this project should be separate from the existing funding of each organization, for mainly critical action such as preserve the endanger animal, conserve the natural space, and create new space or method to exposition and preservation of the nature.
### Background and Arguments

Political demonstrations, as have been seen at WTO meetings and in response to wars, are a double-edged sword. On the one hand, they are an easy way to make an issue known to the public. On the other hand, they tend to polarize the public.

Organizations such as Greenpeace and People for the Ethical Treatment of Animals both have benevolent missions, yet they try to force their messages upon people through several guerilla tactics, such as large-scale demonstrations. Many people are familiar with their cause, but many people are also repulsed by their methods and actions. The demonstrations therefore often do not achieve their desired outcome, as they end up pushing away as many people as they attract.

The NSI is an organization that will convince people to follow its cause in different ways (lobbying, community projects, etc.). The NSI will be an organization that everyone (or almost everyone) likes and agrees with their mission. Because of the immediacy of the NSI’s cause, they do not have the luxury of being able to push people away. They must gain support from the masses and encourage people to assist in as many ways as possible, whether large or small in terms of time and money. Ideally, the NSI’s will become a way of life for people.
## Issue

**Customer Relationships**

### Project
Natural Systems Institute

### Originator
Joyce Chen

### Question at Issue
How should the Institute deal with differences in the needs of its audience and potential customers?

### Contributors

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<tr>
<th>Date</th>
<th>Name</th>
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<tbody>
<tr>
<td>12 Sept 2005</td>
<td>Charles Owens</td>
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### Position

- **Constraint**: The Institute must fulfill its audience mission with integrity; customer needs, where appropriate, may then be served.

### Sources

### Alternative Position

- **Constraint**: The Institute should give high priority to developing and serving a customer base able to support the institute’s professional and financial interests.

### Background and Arguments

The Natural Systems Institute, like every specialized institution, needs customers—broadly defined as groups or individuals who receive or buy a product or service (google “define: customer”)—to help it fulfill its goal of educating the public and involving the community involved in its work of monitoring and maintaining the environment. An important distinction should be made between the terms “customer” and “audience.” “Customers” are nicely distinguished from “audience” by the following example: the automotive review company J.D. Power has paying “customers”—automotive manufacturers—that are different from its “audience”—prospective buyers. NSI is analogous as an organization because the people who require its services—various existing specialized institutions, universities, activist groups, policy makers, etc.—are often different from the people whom it aims to educate and motivate: the public at large. Thus, the way it addresses its customer base should be expectedly different from the way it addresses its audience.

While it may be good business to try to attract and serve customers, the Institute must be prudent in its relationship with its customers to avoid compromising its primary mission. In order to maintain its integrity, the Institute must not accept customers who request a service that is in conflict with any aspect of its mission. In cases where potential conflicts are not clear-cut, internal deliberations of the Institute management will be necessary to decide a course of action. Whether or not it ultimately accepts their requests, of course, the Institute should always maintain a respectful and professional relationship with its potential clients.
The question of what is “natural” when referring to ecological change is quite a controversial one. Ecologists have historically avoided studying urban areas because of the “artificiality” of humans and their impact on the environment (Collins et al, 416). Yet, even in studying so-called “pristine” environments, scientists cannot avoid the effects of human intervention, as “people mobilize nutrients and pollutants, drive species extinct, promote the survival of others, change the composition of the atmosphere and alter landscapes” (Collins et al, 416). Thus, it is actually quite unnatural to assume that the environment should be assessed without regard to human history. To do so would be to not understand an ecology as an ecosystem in the most holistic sense. Even ancient temporal use of land for agriculture or building can alter the ecology of a region by changing the chemistry in flora (Foster et al, 79).

On the other hand, human impacts on the environment cannot be viewed as simply matters of fact. While humans are a “natural” species as much as any other, the tremendous changes they have wrought through pollution, natural resource depletion, and general land use can have long-term detrimental effects on our own species’ survival. The NSI must strike a balance between the extremes of unquestioning acceptance of ecological change and narrow-minded attempts to return all land to pristine, pre-human environments.
Never before has anyone attempted to establish an institution with as broad scope and ambition as the Natural Systems Institute. Organizations that are similar to the NSI in one or more aspects of its mission include the National Parks Service (NPS); the Natural Resources Defense Council (NRDC); various aquariums, zoos, and conservatories; and the UK’s Natural England. All of these entities are either public (government bodies) or nonprofit organizations. DiMaggio and Anheier, in their in-depth study of the sociology of nonprofits vs. for-profits, noted that nonprofits and governmental bodies were most common when the product they provided was a collective good—-in this case, the natural environment (DiMaggio 1990, 141). Furthermore, the fact that nonprofits, by definition, cannot distribute their revenue to their principals may render “nonprofit organizations more likely than for profit organizations to use consumers’ and donors’ dollars reliably for service provision” (DiMaggio 1990, 141). There is also some evidence that for-profits might spend more money enhancing those aspects of their organization that are visible to the public, at the cost of behind-the-scenes work (DiMaggio 1990, 148). Thus, nonprofits may be more trusted by the public than for-profits to selflessly address environmental issues. A nonprofit institution may also suffer less from hierarchical slow-downs than governmental organizations.
Defining Statement

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<th>Project</th>
<th>Question at Issue</th>
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<tr>
<td>Natural Systems Institute</td>
<td>What are the natural resources requirements for the Institute?</td>
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Originator: Joyce Chen

Contributors

Position

- Constraint: The NSI should develop global relationships to acquire access to as many natural resources as possible.
- Objective
- Directive

Sources


Alternative Position

- Constraint
- Objective: The NSI should prioritize more local natural resources above more remote natural resources.
- Directive

Background and Arguments

Any institution that attempts to address the broad realities of global warming and growing human population pressure on the environment faces the challenge of having to pick and choose its battles. Constraints such as budget, precariousness of a particular ecosystem, timing, etc. all factor into which issues should be publicized more than others, and this, in turn, influences which natural resources the institution will focus on at any given moment.

Because of its global scope, the Natural Systems Institute has the unique opportunity to educate the public about environmental problems occurring across the globe, and to foster cross-cultural understanding and concern for these issues. Thus, the NSI must not only have its hands in all of the natural resources in the world, but also, to a lesser degree, in the societies that make use of those natural resources.

Some might argue that such broad ambition will dilute the effectiveness of the NSI. However, by focusing only on localized natural resources and problems, the NSI will become merely another local zoo or aquarium, lacking the ability to tie issues together in the global ecosystem. We have seen how, during el nino years, a disruption of the ocean-atmosphere system in the Pacific has tremendous consequences on the weather around the world. Thus, it is important to be able to tie local circumstances with global effects with the help of global natural resources.
What approach should be taken toward the incorporation of available and emerging technologies?

The Institute should encourage the appropriate use of technologies as applied to the intended task, with a preference for the highest level of technology that fits within the budget.

The Institute should allow each department to decide when and where they choose to employ technology.

The Institute should focus on other issues before technology, and incorporate technology with whatever resources remain.

Technology has greatly aided the acquisition and dispensation of knowledge and information throughout society. By providing scientists with innovative methods of conducting research and experiments, technology enables them to find answers to important questions faster, more accurately, and in greater detail. Information technologies—especially the development of internet-related applications such as websites, email and e-newsletters, weblogs, animation, and webcams—have, in turn, facilitated widespread public access to these scientific discoveries. Organizations that are known for excellence in conducting and disseminating ecological research, such as the Monterey Bay Aquarium Foundation and the Zoological Society of San Diego, have award-winning, expansive websites that offer an equivalent body of virtual educational content to those who might not have the opportunity to physically visit the institution.

While utilizing new technologies is important, incorporating them into the NSI for the sole purpose of having the latest and greatest technologies, without weighing the cost-benefits of acquiring and implementing that technology, could be wasteful and detrimental to the Institute. As Garofalo et al said when explaining how technology should augment teaching, “Features of technology...should be introduced and illustrated in the context of meaningful content-based activities”—that is, technology should be appropriately applied to research and outreach activities (67). It is in the best interest of the Natural Systems Institute to approach technology such that every department keeps up with the latest technologies, but only adopts those that fit the task and within the budget.
## Issue
Internal Adaptivity

### Project
Natural Systems Institute

### Originator
Mark King

### Contributors

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<th>Position</th>
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<tr>
<td>Constraint</td>
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<tr>
<td>Directive</td>
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### Sources
- http://www.wicken.org.uk/habitat.htm
- Team deliberations

### Alternative Position

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<tr>
<th>Position</th>
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<tbody>
<tr>
<td>Constraint</td>
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<td>Directive</td>
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The NSI should view human impact on ecosystems as unnatural.

The NSI should view all human impact on ecosystems as the natural course of environmental evolution.

### Background and Arguments

The NSI is committed to the natural environments, trying to preserve the health of as many species as possible. It therefore should take into account all changing factors when it makes decisions on how the organization should evolve.

Wicken Fen is a wetland preserve in Cambridgeshire, England, dedicated to preserving the land as such. It takes an active role in preserving this wetland, noting that if they left it to nature, it could easily evolve into a woodland. Conservation aims to slow down or hold succession at a stage that is the most beneficial for the species that are present in an area. At Wicken Fen these are early successional wetland habitats including fenlands.

Additionally, the NSI must be amenable to changing organizational structures. The purpose of the NSI is to be different from existing environmental organizations, in that it is adaptive to current trends and reacts to them, instead of designing a plan of action and not being open to change. The Institute cannot be successful in its mission without change.
How should the Natural Systems Institute be introduced to facilitate acceptance and implementation?

The introduction of the Natural Systems Institute should initially target influential individuals within the scientific, policy and environmental communities to secure "expert" support before presenting itself to Team deliberations.

The introduction of the Natural Systems Institute should focus on two major considerations. The first is unorthodox concept behind the NSI: it is an evolutionary response of specialized institutions to the realities of global warming and the impact of population growth on the environment. The second is that many environmental organizations lack credibility with the general public due to the perception of them as environmental Cassandras.

"Shock and Awe" introductions of concepts or institutions are risky. They rely on massive budgets, coordination between multiple parties and a clear, coherent message that can easily be digested by the target audience. Oftentimes such efforts are simply viewed as marketing with little substance.

The NSI must work to gain credibility while at the same time avoiding being dismissed as alarmist or irrelevant, the fate of many environmental groups. Therefore, the NSI's introduction should be staggered to effectively capture the support of subject matter experts, policy makers and the environmental community first. In doing so, the NSI secures credibility among its three most important target audiences. A public roll out after the fact simply introduces an organization and concept that already has credibility among the leaders in the field.
## Defining Statement

<table>
<thead>
<tr>
<th>Project</th>
<th>Natural Systems Institute</th>
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<tbody>
<tr>
<td><strong>Originator</strong></td>
<td>Henning Fischer</td>
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<tr>
<td><strong>Contributors</strong></td>
<td>□ Constraint □ Objective □ Directive</td>
</tr>
<tr>
<td><strong>Position</strong></td>
<td>In its language the Natural Systems Institute ought to maintain both its scientific integrity and a rhetorical capacity suited to the level of public discourse on the environment.</td>
</tr>
<tr>
<td><strong>Sources</strong></td>
<td>□ Constraint □ Objective □ Directive</td>
</tr>
<tr>
<td><strong>Alternative Position</strong></td>
<td>The Natural Systems Institute must adhere to the linguistic norms that characterize the best practices of current scientific publishing.</td>
</tr>
<tr>
<td>□ Constraint □ Objective □ Directive</td>
<td></td>
</tr>
<tr>
<td>The linguistic style employed by the Natural Systems Institute should reflect the most current trends in science-oriented rhetoric.</td>
<td></td>
</tr>
</tbody>
</table>

### Background and Arguments

Science currently finds itself embroiled in political debate. Environmental science in particular tends to court rhetorical controversy. The Natural Sciences Institute team operates on the presumption that all participants in environmental controversies—not only advocacy groups, but also industry spokespeople, government officials, scientists and interested citizens—attempt to influence attitudes and actions, personal opinions and public decisions through the production of persuasive public discourse (Schwarze, 2002).

Political debate is only one area where the discourse is subject to varying interpretation and association. In the business world, witness British Petroleum's successful rebranding campaign into "bp," with the tagline "Beyond Petroleum." The company spent over £100 million in 2000 to rebrand the company, recognizing that "the traditional image of the oil company has become a negative one in the hearts and minds of the consumer" (The Guardian, July 29, 2000).

According to Robert Gottlieb, "Conflicts of interpretation over the terms of environmental discourse also become debates over how to influence the language that people use in talking about the environment" (2001).

As the Natural Systems Institute represents the embodiment of a new concept in the field of environmental sciences, it will face an uphill battle in a highly dynamic rhetorical atmosphere. The current use of language by scientific institutions is often no match for finely honed political rhetoric. The language used by scientists, especially in publication is easily manipulated by hostile parties. By contrast, serious discussions of science conducted using the more traditional vocabulary and tactics of public discourse is often dismissed as bad science, or as a gross oversimplification.

If the Natural Sciences Institute presumes to be a significant participant, contributor, resource and pioneer, it must, make a significant and independent contribution to the way language is used in environmental sciences.
Where should the NSI establish itself?

The NSI should position itself to have the greatest impact on the social and physical environment.

The NSI should be near large cities where the social impact is greatest.

The NSI should be in rural areas where the land and resources are less expensive.

The NSI must address both of these issues in order to be successful in its mission.
<table>
<thead>
<tr>
<th>Defining Statement</th>
<th>Issue: Management Structure</th>
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<tbody>
<tr>
<td>Project</td>
<td>How will the Natural Systems Institute govern the management of its operations?</td>
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<td>Natural Systems Institute</td>
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<tr>
<th>Originator</th>
<th>Projectzed Statement</th>
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<tr>
<td>Henning Fischer</td>
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<tr>
<th>Contributors</th>
<th>Position</th>
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<tbody>
<tr>
<td></td>
<td>Because the management Natural Systems Institute will deal with a host of issues, from scientific programs to budgets to facilities management, the NSI should govern its operations through an organizational structure that facilitates leadership (to give direction), but provides a system of checks and balances (to ensure the operating</td>
</tr>
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<tr>
<th>Sources</th>
<th>Alternative Position</th>
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<thead>
<tr>
<th>Background and Arguments</th>
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<tbody>
<tr>
<td>Organizations faces specific challenges in creating their management structures. There is a dichotomy between top-down control and bottom-up power, especially in organizations focused on less well defined pursuits, as the Natural Systems Institute will be.</td>
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<thead>
<tr>
<th>Alternative Position</th>
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<tbody>
<tr>
<td>The Natural Systems Institute should possess a strong, centralized management structure that directs and drives the people, processes and structures of the NSI in a single, cohesive direction.</td>
</tr>
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<table>
<thead>
<tr>
<th>Background and Arguments</th>
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<tbody>
<tr>
<td>As the NSI is a public, scientific organization with presumable policy goals, the management thereof should provide coherent, directed leadership in managing its external affairs and strategic vision, but allow for latitude in the day to day operations of the scientific units that carry out the NSI’s mission independently.</td>
</tr>
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<table>
<thead>
<tr>
<th>Management Structure</th>
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<tbody>
<tr>
<td>A strong, centralized management structure has the advantage of providing clear direction and efficient leadership in an organization. However, centralized management structures are often highly dependent on few individuals to drive operations forward. Organizations like IBM and General Electric have relied on strong, centralized control to manage their operations, and with great success. However, entities such as these—companies, do not, by definition, allow a large degree of operational independence to their business divisions. Scientific organizations, such as laboratories and research institutes, however, do, both out of need and out of preference.</td>
</tr>
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</table>

| Larger scientific organizations have different goals than profit oriented organizations like the traditional corporation. Their objectives are focused less on specific goals and more on general goals, such as increasing the corpus of scientific knowledge. Their general focus, when combined with the wide array of topics, such as biology, physics, and chemistry, has given rise to management structures that reflect the various disciplines in which the organization is involved. This leads to specialty areas to often behave as autonomous units, sometimes acting in opposition to each other, with total organizational management suffering as a result. |

| A management structure that incorporates the virtues of a centralized, top-down professional management structure with a system of checks and balances to ensure organizational oversight and independence is therefore optimal. There are precedents for this in the scientific community. The Max Planck Society is one, with a President, Secretary General and Executive Committee providing most of the leadership. However, the Senate of the organization decides on the establishment or closure of institutes, on the appointments of scientific members and institute directors, as well as on the budget, guaranteeing a degree of scientific independence and a check on the powers of the executive branch. A dedicated Scientific Council and Sections set the research agenda. |
What should the balance be among research, public education, environmental stewardship, species preservation, advocacy and other possible roles?

The Natural Systems Institute should broadly interpret its mission and balance as many aspects of research, public education, environmental stewardship, species preservation, advocacy and other possible roles as possible.

The Natural Systems Institute should narrowly interpret its mission and focus exclusively on the most pressing environmental issues and avenues of activity related to them.

Many organizations exist to address environmental research, public education, stewardship, species preservation and advocacy. Ranging from local, single-issue oriented groups such as the Friends of the Ventura River, to larger organizations with global scope, such as the United Nations Environment Programme, these organizations complement and co-exist with one another in all of the aforementioned specialty areas.

Each organizational mission has both advantages and disadvantages. Smaller organizations can remain focused on single issues and can nimbly shift strategies to accommodate changing conditions. On the other hand, small organizations can more easily succumb to funding, recruiting and resource challenges when faced with unfavorable conditions.

Large organizations, such as the UNEP, have the luxury of greater funding and a high profile that aids in recruiting and finding resources. However, larger organizations are often asked to confront several issues at once, and must consider larger actors than the state and local governments that small organizations routinely deal with. This can sometimes lead to a lack of strategic focus as they must grapple with multiple complex issues such as biodiversity, environmental assessment, freshwater, governance and law and ozone, all of which are areas that the UNEP deals with.

The Natural Systems Institute should operate on the principle of comparative advantage, which Adam Smith explained as "If a foreign country can supply us with a commodity cheaper than we ourselves can make it, better buy it of them with some part of the produce of our own industry, employed in a way in which we have some advantage."

Extrapolated to the concept of a Natural Systems Institute, if the NSI can produce some set of expertise with greater ease than another organization, and the other organization can produce other sets of expertise in a similar fashion, it would be in both parties' self-interest to specialize in these different areas.

As the Natural Systems Institute proposes to integrate formerly separate fields of study into a new type of interdisciplinary organization, it makes sense for the NSI to specialize in exactly that—issues not addressed by existing scientific and policy communities.
<table>
<thead>
<tr>
<th>Defining Statement</th>
<th>Issue Partnerships</th>
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<tbody>
<tr>
<td>Project</td>
<td>Natural Systems Institute</td>
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<tr>
<td>Originator</td>
<td>Mark King</td>
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<tr>
<td>Contributors</td>
<td>Position</td>
</tr>
<tr>
<td>Sep. 2, 2005</td>
<td>Constraint NSI must develop bi-directional partnerships to help with funding and knowledge sharing</td>
</tr>
<tr>
<td>Charles Owen</td>
<td>Objective</td>
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<td></td>
<td>Directive</td>
</tr>
<tr>
<td>Sources</td>
<td>Alternative Position</td>
</tr>
<tr>
<td>Hamilton, Joan. “Danger Ahead.” Stanford, September/October 2005, 49-55.</td>
<td>Constraint NSI should be independent from all other institutions, finding its own ways to generate funding and information</td>
</tr>
<tr>
<td>Team deliberations</td>
<td>Objective NSI should get involved in unidirectional partnerships as means to generate funding and information</td>
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<td>Directive</td>
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</table>

**Background and Arguments**

The NSI should establish itself in any areas where there is a physical, environmental need, but also where there is a social need.

Zoos, mostly located in or near large metropolitan areas, are helpful in educating large numbers of people (some more successful than others). However, they are often over-budget due to high operating costs; they are sometimes viewed more as amusement parks than learning centers; and do not usually address the issue of preservation, but instead confine animals in habitats very different from their natural environments.

National parks are often located in rural areas, far from large masses of people. They are fantastic areas of environmental preservation, but have difficulty attracting large numbers of people, aside from those on vacation.

The NSI must address both of these issues in order to be successful in its mission.
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<th>Defining Statement</th>
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<td><strong>Project</strong></td>
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<td><strong>Contributors</strong></td>
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<th>Issue</th>
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<tbody>
<tr>
<td>Physical Space Requirement</td>
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<tr>
<th>Question at Issue</th>
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<tr>
<td>Which are the physical space requirements of the Natural Systems Institute?</td>
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<table>
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<th>Position</th>
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<tr>
<td>The Institute should allow regional offices to decide how much physical space they need based on local research programs.</td>
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<th>Alternative Position</th>
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<tr>
<td>The Institute should allocate space equally between all of its regional offices.</td>
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</table>

**Background and Arguments**

The Natural Systems Institute, being a global partnership organization, will require regional offices over many continents, as well as one headquarters. The physical space required for each regional office will be determined by that region’s subcommittee based on specific criteria, which the management will set. These might include number of local programs, number of regional partnerships with other institutions, expectations for future developments, funding requirements and limitations, and human resource requirements.

While it may seem more egalitarian to divide up physical space requirements equally between the different regional offices, the NSI regional centers should ultimately only use as much space and funding as they need, and not more. Therefore, it makes the most sense to allow for regional self-determination of physical space through some sort of application or bidding process.
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<tr>
<th>Defining Statement</th>
<th>Issue Recruiting and Human Resources</th>
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<td>Natural Systems Institute</td>
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<td><strong>Originator</strong></td>
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</tr>
<tr>
<td><strong>Contributors</strong></td>
<td>27th September 2005 Mark King</td>
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<tr>
<td><strong>Sources</strong></td>
<td>Team deliberations</td>
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<tr>
<td><strong>Background and Arguments</strong></td>
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The NSI should recruit employees, such as scientists and physicians, from outside resources to gain new ideas and knowledge to develop methodology for the Institute. Exchanging their knowledge and different points of view can enlighten local workers with regard to the natural systems problem.

Additionally, the NSI should recruit local people to work at each respective site. The advantage of local employees is that they have more insight into problems of their area, as well as having a vested interest in seeing improvements. The Earth Clinic trained 25,000 young women in Ethiopia as health extension workers, to diminish the effects of malaria, tuberculosis, AIDS and malnutrition in Ethiopia [http://www.earthinstitute.columbia.edu/earthclinic/].

Specialists from outside communities can aid the Institute with their knowledge about worldwide ecological issues, but are lacking in local insights and ownership of a particular community. As the mission of the NSI is to create local ecological settings, this type of employee alone will not have all of the necessary information to contribute to the success of the program.

On the other hand, hiring only from the local community will not ensure the success of the NSI’s mission. While invaluable for their vested interest in seeing the benefits of the NSI for their community, they do not have the expertise or the worldwide contacts to effectively solve global problems. The NSI should therefore have a balance of local and non-local employees.
### Defining Statement

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<th>Project</th>
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<td>Originator</td>
<td>Henning Fischer</td>
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### Question at Issue

What standards of measurement should be used by the Natural Systems Institute?

### Position

- As an organization focused on issues of global concern, the Natural Systems Institute must use the International System of Units (SI), specified by the International Bureau of Weights and Measures (Bureau International des Poids et Mesures). However, the NSI recognizes regional differences and will, where applicable, publish local units next to SI units.

### Sources


### Alternative Position

- The Natural Systems Institute should use the International System of Units (SI), specified by the International Bureau of Weights and Measures (Bureau International des Poids et Mesures).

- The Natural Systems Institute must recognize regional differences in the measurement of units and should accommodate them in its used measurement system.

### Background and Arguments

Standardized units of measurement are one of the most crucial elements of scientific inquiry. For that reason, most nations are signatories to the Convention of the Metre, which was signed in 1875 and established an internationally recognized system of weights and measures to harmonize measurement systems worldwide. This way the scientific results generated in a lab in Berkeley, California, USA, can be interpreted by another lab in Beijing, China without the need to convert figures.

The Natural Systems Institute must reflect the standard of international practice if it is to be considered a serious enterprise. Exclusive use of the SI system would, however, make it difficult for more general, non-scientific populations in countries like the United States to grasp the units and measures used.

However, a wholesale acceptance of local norms, such as the English System as practised in the United States of America might lead to confusion and avoidable errors.

Therefore, the NSI should adopt the SI system for all of its operations, but in applicable and non-scientific contexts, be able to publish non-SI units of measurement alongside.
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<th>Defining Statement</th>
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<td><strong>Project</strong></td>
<td><strong>Position on Ecological Change</strong></td>
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<td>Natural Systems Institute</td>
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<tr>
<th>Question at Issue</th>
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<tr>
<td>What will the start-up capacity of the NSI be?</td>
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<td>Mark King</td>
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<td>Team deliberations</td>
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<tr>
<th>Alternative Position</th>
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<td>□ Constraint</td>
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<tr>
<td>■ Objective</td>
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<td>□ Directive</td>
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**Background and Arguments**

Aside from physical needs for startup, including capital, resources, and an information base, the NSI will also need to decide how to commence structurally. Many businesses start with one location, assessing the population's desire for the product. They either do not have the money or the knowledge to be sure that the idea will be successful. The NSI will not have this luxury, as its services will be necessary. It must have sufficient resources and capital to start in many locations simultaneously.

Furthermore, the NSI will have to determine where the greatest need for change lies and establish a site there. This need could be a social need, where people grossly misuse natural resources, or it could be where there is a resource void and someone must step in to preserve the natural resources that remain.
When should the system be ready for implementation?

The time of introduction should be defined as time intervals in each part of the world to make the most benefit to the environmental. The system should start as fast as they can to relieve or stop the global food chain inclination.

Due to the global warming problem, Climate and weather pattern are changing. The numbers of severe natural calamity are increasing every year. Hurricane Katrina Flood in New Orleans, Tsunami in Asia, and Forest fire on Sumatra Island are threaten us as very critical situation. While some warning sign happening around the world, the moving ecology species, ocean warming up, shorted of the food production, and new diseases such as SARS are what we have to confront nowadays. Then, the Natural System Institute should confront the problem as fast as they can to intervene and alleviate the severe catastrophe.

However, some people still did not realize the danger but use the all resource as though it will not be exhausted. Time of introduction is the important factor that effect to cooperation of people around the world.

This problem is very huge as far as it could not be solved on just one part. On the other hand, to ideally launch this project around the world would be great but too short of funding and group of awareness people might cause uneffective result to overall project. Then, this project should establish the milestone depending on warning factor to gradually launch on difference issue such as educating people, preserving endanger animal project in each area of the world.
<table>
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<tr>
<th>Defining Statement</th>
<th>Issue</th>
<th>Inter-Institutional Relationships</th>
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<tbody>
<tr>
<td><strong>Project</strong></td>
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<td>Natural Systems Institute</td>
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<tr>
<td><strong>Originator</strong></td>
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<td>Matthew Lennertz</td>
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<td><strong>Contributors</strong></td>
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<tr>
<td><strong>Position</strong></td>
<td></td>
<td>The NSI should approach the formation of interinstitutional relationship building with a look towards Institutional trust and cooperation to improve transaction costs and increase performance across operational units.</td>
</tr>
<tr>
<td><strong>Alternative Position</strong></td>
<td></td>
<td>Because of the continuing disintegration of the world's ecosystems the Natural Systems Institute should maintain symbiotic relationships with any institution that can aid in its mission.</td>
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<tr>
<td>Team deliberations</td>
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**Background and Arguments**

The NSI faces the daunting task of working in several areas of research and attempting to achieve measurable levels of change. The Institute aims also to play a critical role in educating policy makers and the general public about the state of local, regional and global ecological change. The success of these functions may depend heavily upon the development of strong interinstitutional relationships.

The approach of relationship building should be based upon a theory of Institutional trust (Rus; Iglic, 2005.) According to the Rus and Iglic, an institution has the ability to generalize trust across an organization eliminating the need for close ties based on familiarity. The relationship based on institutional trust lowers transaction costs and directly contributes to the increase of performance due to the lower cost of transactions between the institutions and allows for a wider range of choice in the governance mechanisms of the relationships. This approach can provide a deeper level of cooperation between parties and develop stronger ties in the long term.

It is insufficient then to simply attempt to maintain symbiotic relationships. This approach does not address the need for trust across institutions. It is believed that the NSI's mission is critical enough to demand the best possible method for relationship building. This approach will lead to measurable progress in the NSI's areas of influence.
### Defining Statement

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<th>Project</th>
<th>Natural Systems Institute</th>
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<tr>
<td>Originator</td>
<td>Matthew Lennertz</td>
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<tr>
<td>Contributors</td>
<td>Mark King, Henning Fischer, Joyce Chen, Waewaan</td>
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</table>

### Issue

| Involvement |

#### Question at Issue

**Adaptivity**: How should elements of the system respond to evolving social, political, technological, and environmental conditions?

### Position

| □ Constraint | The Institute should maintain a level of involvement that allows it to become a leader in its areas of concentration |
| □ Objective | |
| □ Directive | |

### Alternative Position

| □ Constraint | The Institute must play an active roll in conservation efforts. |
| □ Objective | |
| □ Directive | |

### Background and Arguments

The Institute will face a serious question regarding its level of involvement in all areas of operation. If the Institute does not plan its level of involvement correctly, it faces a real possibility of ineffectiveness. Like many institutions, the NSI could content itself with playing an active role in conservation efforts and as such realize some level of success in their efforts. However, given the scope of the NSI’s mission, this position would prove inadequate to pursue the breadth of goals set forth. Likewise, simple observation of ecosystems fails to realize any level of change.

In order to maintain any level of leadership the NSI should not only actively observe environments and ecosystems, but maintain a level of involvement that allows them to lead in all areas of focus. The Monterey Bay Aquarium and the Max Planck Institute for Informatics are excellent examples of a high level of involvement in an area of research producing a leader. The Monterey Bay Aquarium involves itself in industry leading research in the world’s oceans, lakes and rivers, while the Max Planck Institute works tirelessly to develop cutting edge algorithms to realize significant change in computing technology. Following the model of these two Institutes, the NSI can reach levels of involvement that will allow it to make significant impacts in its mission goals.
### Background and Arguments

The question of geographic concentration is critical as it speaks to the reach the NSI will try to achieve in its research. If the Institute’s areas of research involve varied locations of the ecosystem then it is in the Institute’s best interest to operate in those locations.

It is not enough for the Institute to operate in a strictly regional capacity as the problems that it aims to ameliorate affect the entire planet. It would be too little affect in too little an area. The better course of action is to develop sound research directions and follow them to the geographic locations that arise from those decisions.

Institutes like the Monterey Bay Aquarium involve themselves in areas far removed from their regional homes. The Aquarium could choose to focus on the immediate waters and rivers surrounding its home, instead they operate in a much larger ecosystem—the Pacific Ocean. Likewise the Shedd Aquarium involves itself in several international projects such as Project Seahorse (a project aimed at conserving seahorses against their medicinal trading in the waters of Southeast Asia) and Iguana Research (a program to breed and then conserve Iguana species from the Bahama Islands).

These efforts should be seen as encouragement for the NSI to extend itself into diverse ecosystems for the purpose of research and conservation. It is not enough to think globally, acting globally will provide a much deeper understanding of the world’s ecosystem and insights towards serious conservation of the world’s natural resources.
### Defining Statement

<table>
<thead>
<tr>
<th>Project</th>
<th>Question at Issue</th>
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<tbody>
<tr>
<td>Natural Systems Institute</td>
<td>What should the Institute consider its outputs to be?</td>
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</table>

<table>
<thead>
<tr>
<th>Originator</th>
<th>Contributors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matthew Lennertz</td>
<td>Mark King, Henning Fischer, Joyce Chen, Waeawaan</td>
</tr>
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<thead>
<tr>
<th>Position</th>
<th>Alternative Position</th>
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</thead>
<tbody>
<tr>
<td>Constraint</td>
<td>The Institute must produce knowledge that is actionable.</td>
</tr>
<tr>
<td>Objective</td>
<td></td>
</tr>
<tr>
<td>Directive</td>
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<tr>
<td>Constraint</td>
<td>The Institute should produce scientific research suitable for publication.</td>
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<td>Objective</td>
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<table>
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<tbody>
<tr>
<td>Max Planck Institute for Informatics</td>
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<tr>
<td><a href="http://www.mpi-sb.mpg.de/about/mission.html">http://www.mpi-sb.mpg.de/about/mission.html</a></td>
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</tr>
<tr>
<td>Team deliberations</td>
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### Background and Arguments

The Natural Systems Institute will engage in extensive research in areas that coincide with its goals. It is then up to the NSI to decide what form their outputs will take. It is possible that the knowledge gained through extensive research be collected and published. Following this path, the institute will build a suitable scientific body of knowledge. This position is not pervasive enough with regards to the project goals because it is far too passive a role. The NSI should produce knowledge that is actionable and aimed at practically effecting any goal it has set for itself. Some institutions have followed this model in an effort to make a larger impact. The Max Planck Institute for Informatics conducts deep scientific research involving informatics. The research, which focuses specifically on new algorithms, find their way into realistic applications such as computer graphics, database and information systems and computational biology. This strengthens the MPI's ability to function in an increasingly competitive world. When outputs are considered as actionable, it will allow NSI to reach measurable results in many areas and allow for continued support and growth. Actionable results will prove the worth or NSI more effectively than a collection of outputs characterized by theoretical scientific knowledge.
C: Function Structure
D: Design Factors
<table>
<thead>
<tr>
<th>Design Factor</th>
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<tbody>
<tr>
<td><strong>Title:</strong> Activity offerings are unclear</td>
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</tr>
<tr>
<td><strong>Project</strong></td>
<td>Natural Systems Institute</td>
</tr>
<tr>
<td><strong>Mode</strong></td>
<td>Education</td>
</tr>
<tr>
<td><strong>Activity</strong></td>
<td>Orienting</td>
</tr>
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<td>Matthew Lennertz</td>
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<table>
<thead>
<tr>
<th><strong>Observation</strong></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Any visitor that arrives at the institute must be able to decipher the offerings presented to them.</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th><strong>Extension</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>If a visitor is unable to clearly understand the offerings of the NSI, they may fail to fully engage with the exhibits, tours or classes offered. If they do not engage fully, they will not have been informed and educated by the NSI and thus not act on behalf of the environment.</td>
<td></td>
</tr>
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</table>

<table>
<thead>
<tr>
<th><strong>Design Strategies</strong></th>
<th><strong>Solution Elements</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Develop brochure highlighting offerings</td>
<td>S Activity menu</td>
</tr>
<tr>
<td>Communicate offerings clearly</td>
<td>S NSI Press</td>
</tr>
<tr>
<td>Link activities where applicable</td>
<td>S Menu Compliment</td>
</tr>
<tr>
<td>List offerings on web site</td>
<td>S NSI Web</td>
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</table>

<table>
<thead>
<tr>
<th><strong>Sources</strong></th>
<th><strong>Associated Functions</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal observation</td>
<td>167. Offer activities</td>
</tr>
</tbody>
</table>
## Title: Articles are not fit to publish

### Project
Natural Systems Institute

### Mode
Education

### Activity
Orienting

### Originator
Matthew Lennertz

### Contributors

### Observation
There are times when an institution wishes to publish the work of its leading researcher but can't because of poor quality.

### Extension
If the NSI faces senior researchers that are simply not very good at writing about the research that they have conducted it is in its best interest to develop some type of solution. The problem is multi-layered because the communication of vital projects not only benefits peer researchers, but the public as well. There then needs to be a focus on translating research to a more common level.

### Design Strategies
- Pair researchers with science writers
- Develop inhouse publishing

### Solution Elements
- S  Write corps
- S  NSI Press
## Title: Ambiguous ROI to partners/benefactors

<table>
<thead>
<tr>
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<td>Project</td>
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<td>Illustrate benefits for partners</td>
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<tr>
<td>Mode</td>
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<td>External Relations</td>
</tr>
<tr>
<td>Activity</td>
<td></td>
<td>Establishing partners &amp; benefactors</td>
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<td>Mark King</td>
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<tr>
<td>Observation</td>
<td></td>
<td>Partners &amp; benefactors often want to know what their ROI will be.</td>
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<tr>
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</tr>
<tr>
<td>Design Strategies</td>
<td>Solution Elements</td>
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</tr>
<tr>
<td>Benefits package</td>
<td>M Goodwill gesture appreciation</td>
<td></td>
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<tr>
<td>Pamphlet of environmental causes</td>
<td>M Empowering pamphlet</td>
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<tr>
<td>&quot;Profit&quot; sharing</td>
<td>M Monetary ROI</td>
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<tr>
<td>Tax benefits</td>
<td>S Environmental tax laws</td>
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Benefits package

Pamphlet of environmental causes

"Profit" sharing

Tax benefits

Version: 2  
Date: October 17, 2005  
Date of Original: October 17, 2005
Title: Unable to determine most beneficial medium

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Natural Systems Institute</td>
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<table>
<thead>
<tr>
<th>Mode</th>
<th>Sources</th>
<th>Associated Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>External Relations</td>
<td>Advertise institute</td>
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</table>

<table>
<thead>
<tr>
<th>Activity</th>
<th>Design Strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Promoting</td>
<td>Segmented campaign</td>
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</table>

<table>
<thead>
<tr>
<th>Observation</th>
<th>Solution Elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>When the NSI is creating advertising and determining through which medium to promote it, it is difficult to know which will be the most beneficial and effective.</td>
<td>E Target selector</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Extension</th>
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</thead>
<tbody>
<tr>
<td>Advertising is expensive and not always effective. Sometimes, advertising campaigns end up doing more harm than good, as they induce public bias that may be negative.</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>External Relations</th>
</tr>
</thead>
<tbody>
<tr>
<td>E Target practice</td>
</tr>
<tr>
<td>E Advertising research</td>
</tr>
<tr>
<td>E Background verifier</td>
</tr>
</tbody>
</table>

| M Advertising bullseye |

<table>
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<th>Contributors</th>
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<tbody>
<tr>
<td>Mark King</td>
</tr>
</tbody>
</table>
Title: Can't decide on classification method

### Project
Natural Systems Institute

### Mode
Research

### Activity
Recording

### Originator
Waewwan Sitthisathainchai

### Contributors

---

### Observation
Too many methods of classification might confuse inside the institute

### Extension
Different methods of classification cause confusion, inability to compare between each research centers and errors in different information. There are many ways to classify things in the natural. Because the NSI settle in overall parts of the world, there are many standards such as different units, and different perspective.

First, The NSI should set the standard of the organization by using the same Unit in overall center, wherever continent and must inform the workers to use same standard.

Second, because cultural factors, there are different perspective of people to divide things. The NSI research center should use the science standard or set the “Standard NSI” to category things in research.

---

### Design Strategies
- Define classification as standard
- Use Classification experts to define
- Adjust standard classification oftenly

### Solution Elements
- Catalog definition
- Expert wanted
- Catalog running

---

Version: 2  
Date: November 20, 2005  
Date of Original: October 21, 2005
<table>
<thead>
<tr>
<th><strong>Project</strong></th>
<th>Natural Systems Institute</th>
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<tbody>
<tr>
<td><strong>Mode</strong></td>
<td>Education</td>
</tr>
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<td><strong>Activity</strong></td>
<td>Orienting</td>
</tr>
<tr>
<td><strong>Originator</strong></td>
<td>Matthew Lennertz</td>
</tr>
</tbody>
</table>

**Observation**

Visitors to many institutes often miss exhibits they may find engaging because they simply can’t find them.

**Extension**

In order for the NSI to maximize the impact of its exhibits, it must provide the opportunity for all visitors to find all exhibits during any specific visit. While it may appear to be a simple matter, it is very important that all visitors can find all exhibits during their visit.

**Design Strategies**

- Develop distinct facility signage
- Distribute electronic facilities map

**Solution Elements**

- S NSInage
- E Electronic map

**Sources**

- Advertise institute

**Associated Functions**

- Title: Can’t find an exhibit

Version: 1  Date: October 16, 2005  Date of Original: October 16, 2005
<table>
<thead>
<tr>
<th>Project</th>
<th>Natural Systems Institute</th>
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</thead>
<tbody>
<tr>
<td>Mode</td>
<td>Conservation</td>
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<td>Joyce Chen</td>
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<td></td>
</tr>
<tr>
<td>Sources</td>
<td></td>
</tr>
<tr>
<td>Associated Functions</td>
<td>Recruit organizations, Recruit people, Recruit instutions, Develop partnerships &amp; alliances, Recruit ideas</td>
</tr>
<tr>
<td>Observation</td>
<td>People, organizations, and institutions often have conflicting agendas and influences that may interfere with their ability to effectively aid the NSI.</td>
</tr>
<tr>
<td>Extension</td>
<td>The NSI is a new mode of preservation, in that it incorporates many previous models. The NSI will need to acquire information from outside sources in order to gain a wide knowledge base and support. It will therefore be necessary to choose people, organizations, and institutions that will support NSI's mission, regarding it as the ideal means to ensuring the health of the environment.</td>
</tr>
<tr>
<td>Design Strategies</td>
<td>Identify institutions with similar missions, Partner with organizations with environmental concerns, Identify experienced persons who could contribute as advisors</td>
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<tr>
<td>Solution Elements</td>
<td>Historical analysis, Environmental scale, Concept value examination</td>
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## Design Factor

<table>
<thead>
<tr>
<th>Project</th>
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<tbody>
<tr>
<td>Natural Systems Institute</td>
<td>Personal observation</td>
<td>Interpret Content</td>
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<table>
<thead>
<tr>
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<tbody>
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<td>Education</td>
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<tbody>
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<td>Matthew Lennertz</td>
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</table>

<table>
<thead>
<tr>
<th>Observation</th>
<th>Extension</th>
</tr>
</thead>
<tbody>
<tr>
<td>If content is misinterpreted then people will be reluctant to cooperate with NSI goals.</td>
<td>The NSI faces a real possibility of it's information being misinterpreted. If people misinterpret the content, the NSI must be prepared to handle the misinterpretation and answer questions with evidence that is clear and can not be misinterpreted. This is going to require cooperation between research and communication divisions.</td>
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### Design Strategies

<table>
<thead>
<tr>
<th>Develop response plan</th>
<th>Solution Elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coordinate information between units</td>
<td>S REply</td>
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</table>

| S Inter-link |

Version: 2  
Date: October 16, 2005  
Date of Original: October 16, 2005
### Design Factor

**Title:** Outreach is time-consuming & expensive

<table>
<thead>
<tr>
<th>Design Factor</th>
<th>Sources</th>
<th>Associated Functions</th>
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<tr>
<td>Project</td>
<td>Team deliberations</td>
<td>Coordinate local projects</td>
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<tr>
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<td>Recruit organizations</td>
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<td>Recruit people</td>
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<tr>
<td>Mode</td>
<td>Team deliberations</td>
<td>Coordinate local projects</td>
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<td>Recruit organizations</td>
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<td>Recruit people</td>
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<td>Activity</td>
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<td>Coordinate local projects</td>
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<td>Recruit people</td>
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<td>Contributors</td>
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<td></td>
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<td>Recruit organizations</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Recruit people</td>
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</tbody>
</table>

### Observation

The time and money it takes to reach out to the public and partners is great.

### Extension

In order to fully reach all of the communities, coordinate global projects among those communities, and recruit benefactors and partners, the NSI will have the problem of time constraints and expenses.

### Design Strategies

- Volunteer corps
- Experimental projects with communities
- Split time between community and NSI

### Solution Elements

- E Volunteer corps of outreach personnel (NSIVCOP)
- S Public interest guage
- S Time sharing

---

**Version:** 2  
**Date:** October 9, 2005  
**Date of Original:** September 20, 2005
### Design Factor

<table>
<thead>
<tr>
<th>Title: Data is not recorded</th>
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<tr>
<td>Natural Systems Institute</td>
</tr>
<tr>
<td><strong>Mode</strong></td>
</tr>
<tr>
<td>Research</td>
</tr>
<tr>
<td><strong>Activity</strong></td>
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<td>Recording</td>
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<tr>
<td><strong>Originator</strong></td>
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<tr>
<td>Waewwan Sitthisathainchai</td>
</tr>
<tr>
<td><strong>Contributors</strong></td>
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</table>

#### Observation

Unrecorded data defect research standard. It make uncertainty and confusing while analyzing data.

#### Extension

The NSI research has the function to conduct research in different time and places. Faulty in recording data while operating might change overall form of the results. Losing data in one period or one place might affect the overall system. There are many factor that cause unrecorded data such as; defective tools, surrounding, unskilled users or incautious workers.

Then, the researchers or the observers should realize and prepare for using recording tools. To repair the losing data we might recollect the data again. However, times are importance factors that make it difficult to recollect the same data.

#### Design Strategies

- Prepare for unexpected situation
- Invent alerting tools

#### Solution Elements

- S Ready step
- S Double check
- S Alert recorder

Version: 2 Date: November 20, 2005 Date of Original: October 21, 2005
### Design Factor

<table>
<thead>
<tr>
<th>Project</th>
<th>Natural Systems Institute</th>
</tr>
</thead>
<tbody>
<tr>
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<td>Research</td>
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<td>Waewwan Sitthisathainchai</td>
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</tbody>
</table>

### Sources
- Assemble & disassemble equipment
- Operate tool
- Gather data
- Gather sample

### Associated Functions
- Tools tags
- Equipment expertise
- Usage diagrams
- Extra fee for tools care
- Set name for tools
- Smart equipment
- Tools checking systems
- Annual tools checking
- Clean mandatory

### Title: Defective equipment

#### Observation
Not ready tools can obstruct the task flow. Researchers have to skip important steps while operating task.

#### Extension
Tools and equipments that are unusable impede effective task. First Unusable tools may lead to accident or injury to the tools operators. Second, tools with dysfunction cause time increasing and ineffective results.

There are two main reasons that lead to ineffective tools, lacking of maintenance in keeping stage and incautious using while operating. Initially, Tools should be checked, clean, and maintenance after using to protect error and destruction of tools. However, some kinds of tools that is hard to maintain to former condition because they was designed to use in short time.

Incautious using is also the reason that researchers cannot reuse the tools. Tools usually be ruined or useless in some function in operating moment. Some tools was ignored while using because the users did not feels take care of the public tools. Moreover, using tools in wrong tasks results bad conditions to the equipments.
### Design Factor

<table>
<thead>
<tr>
<th>Project</th>
<th>Sources</th>
<th>Associated Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Systems Institute</td>
<td>Team deliberations</td>
<td>Identify and contact appropriate local actuators</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mode</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conservation</td>
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<th>Contributors</th>
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<tbody>
<tr>
<td>Joyce Chen</td>
<td></td>
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</table>

### Observation

After the protocol has been established, it may still be difficult to find a party who will take responsibility for fulfilling the task.

### Extension

Because the NSI will be working in partnership with many other institutions and research organizations, it will rely on these partnerships to accomplish certain tasks. In the event that no local or regional partner is available to complete a certain restoration initiative or collaborate on a given project, it is important that the NSI have a contingency plan.

### Design Strategies

- Establish set group of actuators within the NSI
- Rotate through a group of actuators turn by turn
- Have actuators bid for the job
- Look to international organizations
- Postpone the project

### Solution Elements

- **S** Restoration task force
- **S** Restoration duty
- **S** Restoration auction
- **E** The World Conservation Union (IUCN)
- **E** The World Wildlife Fund (WWF)
<table>
<thead>
<tr>
<th>Design Factor</th>
<th>Project</th>
<th>Source</th>
<th>Associated Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source: Artifacts fit under multiple categories</td>
<td>Natural Systems Institute</td>
<td>Team deliberations</td>
<td>Categorize artifacts</td>
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<td>Activity: Analyzing</td>
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<td>Originator: Joyce Chen</td>
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<tr>
<td>Contributors:</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Observation:</th>
<th>Extension:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sometimes an artifact will fit under multiple categories, making it difficult to store and retrieve in a database.</td>
<td>The establishment of the Burmese python in Everglades National Park (freed snakes who were able to survive and propagate in the wild) makes it an artifact of the international pet trade. Although Everglades rangers are attempting to eradicate the nonnative species, the fact that it has been able to survive so well could mutate the Everglades ecosystem. Categorizing this species--now thriving on two continents--in the NSI database requires consideration and clarity so that researchers who wish to access the data later will be able to distinguish the two circumstances and find the appropriate information.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Design Strategies</th>
<th>Solution Elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Label, instead of categorize, each artifact or species</td>
<td>M Artifact Labeling System</td>
</tr>
<tr>
<td>Categorize artifact 1st with respect to its most outstanding qualities &amp; mention minor categories</td>
<td>M Artifact Reference Manual</td>
</tr>
<tr>
<td>Extinguish the artifact from its other possible categories</td>
<td>M Resource Elimination Team</td>
</tr>
<tr>
<td>Design Factor</td>
<td>Sources</td>
</tr>
<tr>
<td>---------------</td>
<td>---------</td>
</tr>
<tr>
<td>Project</td>
<td>Natural Systems Institute</td>
</tr>
<tr>
<td>Mode</td>
<td>Conservation</td>
</tr>
<tr>
<td>Activity</td>
<td>Repairing</td>
</tr>
<tr>
<td>Originator</td>
<td>Joyce Chen</td>
</tr>
<tr>
<td>Contributors</td>
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</table>

**Observation**

In some cases, the ecosystem has not been restored or repaired to its desired state.

**Extension**

When the process of destruction cannot be reversed due to natural, political, social, economic, or technical reasons, the NSI must understand that their interventions are not guaranteed to succeed. The United Nations Food and Agriculture Organization has an online repository of documents detailing the successes and failures of land conservation in Africa. The NSI should be well-versed in historical cases relating to its intervention project, but must also be prepared to consider contingency plans.

**Design Strategies**

- Establish the area as protected
- Change the intervention so that a new goal is achieved
- Document efforts for later groups to work from
- Give up on that project

**Solution Elements**

- M Habitat Repurchase
- M Proposal Revision
- M Intervention Assessment
### Design Factor

**Title:** Convince decision-makers

<table>
<thead>
<tr>
<th>Project</th>
<th>Sources</th>
<th>Associated Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Systems Institute</td>
<td></td>
<td>Report recommendations Communicate findings</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mode</th>
<th>Activity</th>
<th>Originator</th>
<th>Contributors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conservation</td>
<td>Maintaining</td>
<td>Joyce Chen</td>
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</table>

<table>
<thead>
<tr>
<th>Observation</th>
<th>Extension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scientists and project managers must convince the decision-making body at NSI and in the government that the recommendations made should be implemented. The decision-makers will then have to determine which changes to make.</td>
<td>With the NSI scientists constantly gathering data, conducting research, and designing ways to restore, maintain, and create within environments, they must compete with other groups from within and outside of the NSI for funding and permission to implement. Policy-related issues will need to be publicized so that changes can be enacted in government. The public may need to be convinced if the proposed policy requires a vote. The decision-makers of interest may be NSI managers, policy-makers, the public, or any other partner institutions.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Design Strategies</th>
<th>Solution Elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provide a structured proposal for internal NSI requests</td>
<td>M NSI Proposal Template</td>
</tr>
<tr>
<td>Create review board to read proposals</td>
<td>M Internal Review Board</td>
</tr>
<tr>
<td>Start a campaign group to publicize policy-related issues</td>
<td>M NSI Campaign Group</td>
</tr>
<tr>
<td>Start a newsletter to educate the public</td>
<td>M Eye on the Earth</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Design Factor</th>
<th>Sources</th>
<th>Associated Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Project</strong></td>
<td>Natural Systems Institute</td>
<td><strong>Model</strong></td>
</tr>
<tr>
<td><strong>Activity</strong></td>
<td>Observing</td>
<td><strong>Design Strategies</strong></td>
</tr>
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<td><strong>Originator</strong></td>
<td>Joyce Chen</td>
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<tr>
<td><strong>Contributors</strong></td>
<td></td>
<td><strong>Solution Elements</strong></td>
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</tbody>
</table>

**Title:** Missing criteria to determine significance of data

**Observation:**

In order for data to be useful, we must know what we are looking for, why we want the data, and how we plan to use it.

**Extension:**

In addition to a scientific plan, scientists must know the relative significance of the data they are collecting. Moreover, they must be able to articulate this significance in order for the researchers and interns who are collecting the data to know what to do with it.
### Design Factor

<table>
<thead>
<tr>
<th>Project</th>
<th>Sources</th>
<th>Associated Functions</th>
</tr>
</thead>
</table>
| Natural Systems Institute | | Compare data with viewpoint  
| | | Distill data into recommendations |

<table>
<thead>
<tr>
<th>Mode</th>
<th>Activity</th>
<th>Originator</th>
<th>Contributors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conservation</td>
<td>Interpreting</td>
<td>Joyce Chen</td>
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</table>

<table>
<thead>
<tr>
<th>Observation</th>
<th>Extension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sometimes the data collected contradicts the initial hypothesis made.</td>
<td>Since scientists are only making educated guesses about the type of data they will acquire, there is a good chance that their hypotheses will not be supported by the data collected. It is important to have a protocol in place so that a definitive conclusion may be drawn from this contradiction, and so that the data is neither wasted nor the original hypothesis immediately overturned.</td>
</tr>
</tbody>
</table>

### Design Strategies

- Redo the experiment
- Process the data using a different method
- Reassess the value of the original viewpoint
- Conduct a new experiment in the series with a new hypothesis to collect the same kind of data

### Solution Elements

- **M** Data Resubmission
- **E** Scientific Review Board
- **S** Science Assist

---

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<table>
<thead>
<tr>
<th>Observation</th>
<th>Extension</th>
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</thead>
<tbody>
<tr>
<td>The vast amount of data that is collected by NSI computers and scientists everyday is difficult to parse through to isolate the significant pieces.</td>
<td>With data about climate, species location and breeding patterns, tectonic movement, temperature levels, resource depletion, etc. entering the NSI everyday, it is difficult to isolate the significant pieces of data that are either positive or negative indications of change requiring action. Traditional means of processing large data streams have used database management systems (DBMSs) to aid in the identification of significant data. However, these methods make it difficult to compare current data with previously obtained data, and do not accommodate a large number of triggers (Carney et al 2002, 1).</td>
</tr>
</tbody>
</table>
Design Factor

Title: New functions are not easily integrated

Project
Natural Systems Institute

Mode
Conservation

Activity
Modifying

Originator
Joyce Chen

Contributors

Observation
Once structures have been modified, it will then be necessarily to reassess and possibly integrate their functions in new ways.

Extension
Because transformation involves the creating of new structures or the converting of old ones in a particular environment, the functions of these structures may be new or changed. Discoveries may be made along the way as to how the functions can integrate so as to improve the performance of the environment. Thus, scientists will work with designers to integrate the functions in a way that seems most beneficial to the transformed area.

Design Strategies
Use iterative design process to test integrations in labs or on a small scale
Integrate in parallel with the transformation

Solution Elements
M Concept Prototyping Team
M Integrations Lab
S In-Field Integration

Sources

Associated Functions
Integrate functions
Design Factor

Title: Exhibits not timely

<table>
<thead>
<tr>
<th>Design Strategies</th>
<th>Solution Elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exhibits change every few months</td>
<td>E    Exhibit rotation</td>
</tr>
<tr>
<td>Exhibit designers change every few months</td>
<td>M    Exhibit revolving door</td>
</tr>
<tr>
<td>Solicit outside ideas for exhibits</td>
<td>E    Exhibit idea</td>
</tr>
<tr>
<td>Solicit outside designers/scientists</td>
<td>M    Prominent exhibits</td>
</tr>
<tr>
<td>Create exhibits within exhibits, and as one moves out, the others get bigger and a new one comes in</td>
<td>S    Exhibit vacuum</td>
</tr>
</tbody>
</table>

**Project**
Natural Systems Institute

**Mode**
External Relations

**Activity**
Promulgating

**Originator**
Mark King

**Contributors**

**Observation**
Many times static exhibits are not timely in their message to generate curiosity and support.

**Extension**
When organizations decide to host exhibits, there is always the risk that the content is not appropriate to outside factors and audiences. This could lead to a general lack of interest in the exhibit, and ultimately the lack of interest in the NSI’s mission.

External Relations
Team deliberations

**Associated Functions**
host static exhibits

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### Design Factor

**Title:** Materials not available

<table>
<thead>
<tr>
<th>Project</th>
<th>Sources</th>
<th>Associated Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Systems Institute</td>
<td></td>
<td>Acquire appropriate materials</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Execute plan</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mode</th>
<th>Activity</th>
<th>Originator</th>
<th>Contributors</th>
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<tbody>
<tr>
<td>Conservation</td>
<td>Repairing</td>
<td>Joyce Chen</td>
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</table>

#### Design Strategies

- Don’t repair the object/resource
- Create a repository to store a collection of potentially useful materials
- Borrow materials from other sources

#### Observation

The necessary and appropriate materials needed to repair an object or resource may not be available.

#### Extension

Very specific materials, chemicals, and tools may be needed to repair an object or habitat. These may not be immediately available due to scarcity, distance, or financial reasons. Not being able to obtain the necessary materials may hinder progress and cause inefficiencies within the NSI system. Therefore, a solution should try to make the materials available as needed.

#### Solution Elements

- M Materials Library
- S NSI Trading Post
- M Partnership Contract

**Version:** 1

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<table>
<thead>
<tr>
<th>Design Factor</th>
<th>Title: No recipients for recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Project</strong></td>
<td>Natural Systems Institute</td>
</tr>
<tr>
<td><strong>Mode</strong></td>
<td>Conservation</td>
</tr>
<tr>
<td><strong>Activity</strong></td>
<td>Interpreting</td>
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<td>Joyce Chen</td>
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<td><strong>Contributors</strong></td>
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<tr>
<td><strong>Design Strategies</strong></td>
<td></td>
</tr>
<tr>
<td>Create group whose main task is to review all recommendations</td>
<td></td>
</tr>
<tr>
<td>Create a repository for all recommendations awaiting review</td>
<td></td>
</tr>
<tr>
<td>Priority system to allow most urgent recommendations to be reviewed first</td>
<td></td>
</tr>
<tr>
<td><strong>Solution Elements</strong></td>
<td></td>
</tr>
<tr>
<td>E Restoration Review Committee</td>
<td></td>
</tr>
<tr>
<td>M Sci-Rec Drop Box</td>
<td></td>
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<tr>
<td>S Restoration Priority System</td>
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</tbody>
</table>

**Observation**

In rare cases, a recommendation for restoration intervention may have no obvious recipient.

**Extension**

Perhaps the timing’s not right, or the resources are not currently available, or there simply are not enough project managers to go around. Whatever the case, there may be times when scientists’ recommendations cannot be put into action immediately. For these particular situations, the NSI should take care not to lose the recommendations, but to put them aside in a safe place for future reference, or devise a solution so that all recommendations are equally recognized.
### Design Factor

**Title: NSI support contributes to inefficiency**

<table>
<thead>
<tr>
<th>Project</th>
<th>Natural Systems Institute</th>
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<tbody>
<tr>
<td>Mode</td>
<td>Conservation</td>
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<tr>
<td>Activity</td>
<td>Managing</td>
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<tr>
<td>Originator</td>
<td>Joyce Chen</td>
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</tbody>
</table>

**Contributors**

**Observation**

When the NSI gets involved with managing and overseeing restoration, it may contribute to operating inefficiency.

**Extension**

In some cases, the NSI will partner directly with a regional or local group to conduct research or accomplish an intervention. Depending on where the research plan was originated, the local group or the NSI may be the leading partner on the project. In either case, it is possible that the NSI’s support will interfere with the efficiency of the project if it has regulations or additional interests to investigate.

<table>
<thead>
<tr>
<th>Design Strategies</th>
<th>Solution Elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specify each partner’s involvement before entering the agreement</td>
<td>M Partnership Contract</td>
</tr>
<tr>
<td>Give authority to NSI research groups to conduct research autonomously of the larger organization</td>
<td>M Autonomous Research Group</td>
</tr>
<tr>
<td>Design Factor</td>
<td>Sources</td>
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<tr>
<td><strong>Project</strong></td>
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<tr>
<td>Natural Systems Institute</td>
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<td><strong>Mode</strong></td>
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<td>Conservation</td>
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<tr>
<td>Modifying</td>
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<td><strong>Originator</strong></td>
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<tr>
<td>Joyce Chen</td>
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<td><strong>Contributors</strong></td>
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</table>

**Observation**

When the NSI partners with other institutions, those partners may want to oversee their own research even if NSI is the lead partner.

**Extension**

In some cases, the NSI will partner directly with a regional or local group to conduct research or accomplish an intervention. Depending on where the research plan was originated, the local group or the NSI may be the leading partner on the project. Whether the NSI plays a large or small role in the research, the partner may wish to oversee itself instead of having the NSI instruct the process. This may be because the partner institution is more familiar with the target environment/species, or more friendly with the community involved in the project.
Title: Political barrier to converting structure

Often there will be a political reason why the NSI cannot accomplish its modification of the environment.

The extent to which our natural resources should be protected and restored has been a controversial issue in this country for decades, especially if we rely on the depletion of those natural resources in our daily lives. If the NSI decides it is important to create a preserve in an area that is currently the site of an important factory or neighborhood, for example, the community will undoubtedly object, and the measure will face great challenges in congress. Aligning the NSI's goals with the public and corporate lobbyists' interests will be difficult.

Design Strategies
- NSI should have its own means to lobby for policy changes
- Attempt to choose politically neutral projects only
- Use strategies based on known group psychology to introduce new measures in a way that the public will be more receptive to them

Solution Elements
- M NSI Campaign Group
- M Internal Review Board
- S Policy and Strategy Group
### Design Factor

**Title:** Need to preserve database capacity

<table>
<thead>
<tr>
<th><strong>Project</strong></th>
<th>Natural Systems Institute</th>
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<tbody>
<tr>
<td><strong>Mode</strong></td>
<td>Conservation</td>
</tr>
<tr>
<td><strong>Activity</strong></td>
<td>Observing</td>
</tr>
</tbody>
</table>

**Originator:** Joyce Chen

**Contributors**

**Observation**

In order to continue adding data to a database, the data must be archived for easy management and server memory may need to be expanded.

**Extension**

Data collected from laboratories and in the field will need to be stored in an easily-accessible database. Moreover, the NSI will need multiple database servers in order to accommodate increasing amounts of data, and efficient archiving algorithms so that data may be retrieved quickly. Successful archiving can only be achieved when implemented with database backup; archiving--removing rarely accessed data--helps speed up the backup process, and backed up data is essential to maintaining a reliable database.

**Design Strategies**

- Schedule regular archiving and backup
- Purchase new servers as database expands
- Store data more efficiently

**Solution Elements**

- E Autoarchive
- E Database Backup
- S CondensData

### Sources


### Associated Functions

Inventory resources
<table>
<thead>
<tr>
<th>Design Factor</th>
<th>Title: Scarce resources</th>
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</thead>
<tbody>
<tr>
<td><strong>Project</strong></td>
<td>Natural Systems Institute</td>
</tr>
<tr>
<td><strong>Mode</strong></td>
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<tr>
<td><strong>Activity</strong></td>
<td>Maintaining</td>
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<td>Joyce Chen</td>
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### Observation
A specific natural resource may be so scarce that the NSI will not be able to maintain it.

### Extension
When a species is becoming extinct due to its declining habitat or a shift in the food chain, that particular resource may become so scarce that the scientists will have a hard time studying, securing, and keeping track of it. For example, the ivory-billed woodpecker was thought to be extinct more than 60 years ago; now that there have been recent sightings of the species in the Arkansas bayou, scientists and conservationists must determine how to maintain the species and prevent it from actually becoming extinct.

### Design Strategies
- Protect and reclaim the species’ habitat
- Capture and breed the species in captivity

### Solution Elements
- Habitat Repurchase
- Bayou Act
- Endangered Species Program

### Sources
### Title: Plan requires too many resources

<table>
<thead>
<tr>
<th>Design Factor</th>
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<tbody>
<tr>
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<td>Conservation</td>
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<tr>
<td>Activity</td>
<td>Creating</td>
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<tr>
<td>Originator</td>
<td>Joyce Chen</td>
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<td>Contributors</td>
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#### Observation

Upon testing, scientists and designers may discover that the transformation plan will require more resources than they can acquire.

#### Extension

Often an idea seems feasible until it is actually tested. The resources required to realize the project may be initially underestimated. These may be human, financial, natural, or material resources. It is important to address this problem in the testing phase, before the plan is actually implemented, or else the project risks failure or incompletion.

#### Design Strategies

- Redesign the plan to use less resources, and resubmit the plan
- Find/borrow resources
- Scale down the plan
- Design and create alternative resources

#### Solution Elements

- **E** Internal Review Board
- **S** Material Trading Post
- **S** Resource Alliance
- **S** Creation Lab

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<tr>
<th>Design Factor</th>
<th>Sources</th>
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<tbody>
<tr>
<td>Title: Difficult to determine which opportunity should be pursued</td>
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<th>Mode</th>
<th>Activity</th>
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<tbody>
<tr>
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<td>Conservation</td>
<td>Creating</td>
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</table>

<table>
<thead>
<tr>
<th>Design Strategies</th>
<th>Solution Elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>A software program helps to weight the many benefits and drawbacks for each solution</td>
<td>M  Relatn II</td>
</tr>
<tr>
<td>Designers and scientists model/simulate a few of the best ideas</td>
<td>S  Creation Lab</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Observation</th>
<th>Extension</th>
</tr>
</thead>
<tbody>
<tr>
<td>With designers coming up with many solution ideas, it is often difficult to determine which opportunity should be pursued.</td>
<td>There are many ways to create new structures, processes, and systems within an environment. Designers should thrive during transformation because opportunities will abound and new ideas can be considered. However, it will be important to be able to pick the most viable opportunity from the many that are found or generated. Different opportunities may require different time frames, financial resources, human resources, cause different levels of human impact on an environment, and elicit different reactions from the public.</td>
</tr>
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</table>
### Design Factor

<table>
<thead>
<tr>
<th>Project</th>
<th>Design Strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Systems Institute</td>
<td>Maintain central office in neutral country</td>
</tr>
<tr>
<td></td>
<td>Maintain neutrality of organization</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Sources</th>
<th>Associated Functions</th>
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<tbody>
<tr>
<td></td>
<td>Observe Interaction</td>
</tr>
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<table>
<thead>
<tr>
<th>Mode</th>
<th>Activity</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education</td>
<td>Researching</td>
<td>Wars may prevent the NSI from carrying out its mission.</td>
</tr>
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<table>
<thead>
<tr>
<th>Contributors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matthew Lennertz</td>
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</tbody>
</table>

### Observation

Wars may prevent the NSI from carrying out its mission.

### Extension

Although unavoidable by the NSI, wars will occur in nations where we have branch sites that could hinder:

1. Peoples’ commitment to the NSI
2. NSI land/physical resources
3. NSI funding

### Solution Elements

<table>
<thead>
<tr>
<th>E</th>
<th>Neutral HQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>E</td>
<td>Organizational neutrality</td>
</tr>
</tbody>
</table>
## Design Factor

<table>
<thead>
<tr>
<th>Project</th>
<th>Sources</th>
<th>Associated Functions</th>
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</thead>
</table>

### Design Strategies

- Convert surrounding infrastructure instead
- Remove structure entirely
- Remove surrounding structures
- Increase robustness of the structure
- Don’t convert, allowing structure to meet its fate

### Solution Elements

- Resource Acquisition Protocol
- Resource Relocator
- Resource Elimination Team
- Gene therapy

### Observations

Converting structures in the natural environment is a difficult task when the act of changing the status quo could threaten a species’ survival.

### Extensions

A delicate balance between welfare and intervention must be struck in the act of conserving species and environments. Nonetheless, it is undeniable that intervention is necessarily and appropriate under specific circumstances, i.e. to save a species from extinction caused by human destruction of its habitat. The challenge in changing the structure of an environment is readjusting the ecosystem in a way that will not destroy the way the species interrelate or depend on one another. Sometimes, a component of the ecosystem is too fragile to change in the most efficient manner, and other measures must be considered to achieve the desired outcome.
Design Factor

Title: Environment is not appropriate to monitor

Project
Natural Systems Institute

Mode
Research

Activity
Defining

Originator
Waewwan Sitthisathainchai

Contributors

Observation
Unreachable environment lead to difficulties to get inside for the overall research.

Extension
The environment monitoring results directly to global scale project of the natural System Institute. Some forbidden areas, by government policy or area configuration, might important to the overall data. It is hard for researcher to get some data or sample and also hard to get insight of overall factors in different areas. This may result error in data analyzing. In this case, the NSI research groups might need support from the local governments or local communities to lead the research operation instead.

In addition, some kind of area is tough for researchers to monitor such as under the sea or in the dark cave. The researchers need some specific tools to get into this space and capture the picture or some substance without destroying the overall environment.

Design Strategies
- Contact with the global organization
- Build close connection directly to each government
- Invent some specific tools that can monitoring in specific area

Solution Elements
- Global organization
- Falcon wing
- win-win situation
- Virtual camera
- Virtual guildcam

Sources
- Define problem
- Set the hypothesis
- Identify strategy
- Devise method
- Set definition
- Apply definition
- Choose environment
- Define interpretation method

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<tr>
<th>Design Factor</th>
<th>Title: Work is too esoteric</th>
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<tr>
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<tr>
<td><strong>Mode</strong></td>
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<td><strong>Activity</strong></td>
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<tr>
<td><strong>Originator</strong></td>
<td>Mark King</td>
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### Observation
Scientific knowledge is often too esoteric for the public to understand.

### Extension
The NSI will discover information that is scientifically based, yet needs to be distributed to the public in order to take effect. If it is too simple, the NSI will not be taken seriously. More importantly, though, the NSI runs the risk of alienating people because they cannot understand the NSI’s research.

Just as doctors give diagnoses in “plain language”, the NSI must be careful about giving the public too much information with terminology that they do not understand.

### Design Strategies
- Language system
- Guidebook on speaking to public
- Public training programs
- Human interaction training
- Widely distributed informative pamphlet
- NSI/public liaison

### Solution Elements
- M Scientific / lay person translator
- M Public guide
- M Language information classes
- M Regular person training
- M NSI helpful hints
- S NSI translator
<table>
<thead>
<tr>
<th>Design Factor</th>
<th>Title: Exhibits are not engaging</th>
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<tbody>
<tr>
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<td><strong>Activity</strong></td>
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<td>Matthew Lennertz</td>
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<thead>
<tr>
<th><strong>Observation</strong></th>
<th><strong>Extension</strong></th>
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</thead>
<tbody>
<tr>
<td>Many institutions struggle to develop exhibits that fully engage and teach their visitors and protect any resources contained within. Their attempts often result in exhibits that are not engaging.</td>
<td>The purpose of drawing visitors into the Institute is to expose them to features of the ecosystem that are in need of attention and in some cases delicate protection. The visitors will play a passive role moving through the facilities unless the exhibits are engaging. If they succeed in capturing the attention of visitors, they can then capitalize the opportunity and actually educate them.</td>
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</table>

<table>
<thead>
<tr>
<th><strong>Design Strategies</strong></th>
<th><strong>Solution Elements</strong></th>
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</thead>
<tbody>
<tr>
<td>Create interactive exhibits</td>
<td>S  NSI Interact</td>
</tr>
<tr>
<td>Catalog successful engagement methods</td>
<td>S  NSI Engage</td>
</tr>
<tr>
<td>Design Factor</td>
<td>Title: Geopolitical instability</td>
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<td><strong>Project</strong></td>
<td>Natural Systems Institute</td>
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<tr>
<td><strong>Mode</strong></td>
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<tr>
<td><strong>Activity</strong></td>
<td>Promulgating</td>
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<tr>
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<td>Matthew Lennertz</td>
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<td><strong>Contributors</strong></td>
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</table>

**Sources**

**Associated Functions**

- Coordinate global projects

**Observation**

Wars may prevent the NSI from carrying out its mission.

**Extension**

Although unavoidable by the NSI, wars will occur in nations where we have branch sites that could hinder:

1. Peoples’ commitment to the NSI
2. NSI land/physical resources
3. NSI funding

**Design Strategies**

- Maintain central office in neutral country
- Maintain neutrality of organization

**Solution Elements**

- Neutral HQ
- Organizational neutrality
<table>
<thead>
<tr>
<th>Design Factor</th>
<th>Title: What do you choose to supplement primary work?</th>
</tr>
</thead>
<tbody>
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<td><strong>Activity</strong></td>
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<tr>
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<td>Mark King</td>
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<tr>
<td><strong>Contributors</strong></td>
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<tr>
<td><strong>Observation</strong></td>
<td>How will the NSI know what it is missing in order to solicit additional references?</td>
</tr>
<tr>
<td><strong>Extension</strong></td>
<td>It is a common problem with any organization: how do you know what you don’t know?</td>
</tr>
<tr>
<td><strong>Design Strategies</strong></td>
<td>Invite experts from different fields to serve on board of directors</td>
</tr>
<tr>
<td></td>
<td>Research team</td>
</tr>
<tr>
<td></td>
<td>Traveling branche liaisons</td>
</tr>
<tr>
<td><strong>Solution Elements</strong></td>
<td>M Diversified board of directors</td>
</tr>
<tr>
<td></td>
<td>E Unknown research</td>
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<td></td>
<td>S Information couriers</td>
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</table>
### Design Factor

**Title:** Ill-feeling towards environmental org.

<table>
<thead>
<tr>
<th><strong>Project</strong></th>
<th><strong>Design Strategies</strong></th>
<th><strong>Solution Elements</strong></th>
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</thead>
<tbody>
<tr>
<td>Natural Systems Institute</td>
<td>Community involvement</td>
<td>E Community Care</td>
</tr>
<tr>
<td></td>
<td>Grassroots effort</td>
<td>E Emergence</td>
</tr>
<tr>
<td></td>
<td>Carefully choose spokespeople</td>
<td>E Foundation Face</td>
</tr>
<tr>
<td></td>
<td>Segmentation of populous</td>
<td>M Outreach planning</td>
</tr>
</tbody>
</table>

**Mode**
- External Relations

**Activity**
- Information Sharing

**Originator**
- Mark King

**Contributors**

**Observation**
- Many people have negative feelings towards environmental groups and stereotypes about their work.

**Extension**
- Due to some environmental groups controversial tactics, such as Greenpeace and PETA, many people are unwilling to listen to other environmental groups messages.

**Associated Functions**
- Recruit organizations
- Recruit people
- Recruit institutions

**Sources**

---

**Version:** 1  
**Date:** October 17, 2005  
**Date of Original:** October 17, 2005
### Design Factor

**Project**  
Natural Systems Institute

**Mode**  
External Relations

**Activity**  
Promoting

**Originator**  
Mark King

**Contributors**

<table>
<thead>
<tr>
<th>Sources</th>
<th>Associated Functions</th>
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<tbody>
<tr>
<td></td>
<td>Host events</td>
</tr>
</tbody>
</table>

**Observation**  
Land and resources to build physical structures are scarce.

**Extension**  
There are two main goals of the NSI:

1. To preserve and maintain ecological areas.
2. To inform the public and encourage them to do #1.

Land will be necessary for ecological preservation areas. However, land will also have to be designated for physical buildings to house research, classes, events, etc. The NSI will have to figure out how much land can be taken away from nature and given to buildings.

Additionally, the structures that the NSI builds must not conflict with the natural landscape.

**Design Strategies**

- Portable structures
- Environmentally-friendly structures
- Structures that integrate outside & inside
- Dual purpose community centers

**Solution Elements**  
EcoStructure
## Design Factor

**Project**
Natural Systems Institute

**Mode**
Administration - Integration

**Activity**
Planning

**Originator**
Henning Fischer

**Contributors**

### Observation
Plans cannot always be executed.

### Extension
That plans cannot always be executed is self-evident. This arises due to several reasons. The plans may be factually incorrect. The plans may not be detailed enough. The plans may be unclear. The plans may be unrealistic.

The creation of plans that cannot be executed can be mitigated by careful foresight and planning, which is the nature of this problem.

### Design Strategies
- Complete plans to a standard level of detail
- Check plans for clarity
- Check plans for accuracy
- Incorporate individuals who will execute into the planning process

### Solution Elements
- **S** Standard Planning Templates
- **M** Universal Planning Vocabulary (UML)
- **S** Interdisciplinary Planning Teams
- **S** Plan Check Process

Version: 1

Date: October 17, 2005

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<table>
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<tr>
<th>Design Factor</th>
<th>Conflicting competencies</th>
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<thead>
<tr>
<th>Sources</th>
<th>Associated Functions</th>
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<tbody>
<tr>
<td></td>
<td>Identify complimentary competencies</td>
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<table>
<thead>
<tr>
<th>Observation</th>
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</thead>
<tbody>
<tr>
<td>Different groups within organizations may have similar capabilities that lead to redundancy.</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>Extension</th>
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</thead>
<tbody>
<tr>
<td>Redundancy with an organization causes inefficiency. This is frowned upon in management literature, but commonly accepted as the price of doing business. However, redundancy becomes an issue when trying to operate a lean organization (its inefficient) or when trying to integrate formerly separate functional groups (turf battles). And that's only if you are actually able to identify them.</td>
</tr>
<tr>
<td>The problem is manifold. One must identify conflicting competencies and then resolve them in a manner that is acceptable to both parties.</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Design Strategies</th>
<th>Solution Elements</th>
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<tbody>
<tr>
<td>Identify conflicting competencies.</td>
<td>S Operations Oversight Team</td>
</tr>
<tr>
<td>Reduce the number of conflicting competencies.</td>
<td>S Operations Matrix &amp; Assessment</td>
</tr>
<tr>
<td>S Centralized Common Operations</td>
<td></td>
</tr>
<tr>
<td>Design Factor</td>
<td>Inability to establish desired outcomes</td>
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<td><strong>Project</strong></td>
<td>Natural Systems Institute</td>
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<td><strong>Contributors</strong></td>
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<tr>
<td><strong>Observation</strong></td>
<td>NSI groups may find complementary activities and competencies, but may not be able to agree on what the desired outcome of the collaboration will be.</td>
</tr>
<tr>
<td><strong>Extension</strong></td>
<td>Groups that have complementary research activities and competencies will want to work together because it is mutually beneficial. However, each may have different goals. For example, one may have equipment the other needs, while the other has access. However, neither wants to work together towards one goal and they therefore may compete, even if after agreeing to collaborate. The problem is one of alignment between the two parties</td>
</tr>
<tr>
<td><strong>Design Strategies</strong></td>
<td>Build cooperation through trade-offs</td>
</tr>
<tr>
<td></td>
<td>Align desired outcomes between teams</td>
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<td></td>
<td>Negotiate</td>
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<tr>
<td><strong>Solution Elements</strong></td>
<td>Quid Pro Quo Collaboration</td>
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<td></td>
<td>Team Workshops</td>
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<td>Negotiations</td>
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<tr>
<td>Design Factor</td>
<td>Inefficient integration</td>
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<td><strong>Contributors</strong></td>
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<tr>
<td><strong>Observation</strong></td>
<td>Integration succeeds, but areas that have been integrated prove to be unharmonized and very inefficient—costly, time consuming, bad for morale.</td>
</tr>
<tr>
<td><strong>Extension</strong></td>
<td>Sometimes your best just isn't good enough. NSI may succeed in integrating areas, but it may be more trouble than it is worth from an operational point of view. What should NSI do with integrated groups that simply underperform and cannot be fixed?</td>
</tr>
<tr>
<td><strong>Design Strategies</strong></td>
<td><strong>Solution Elements</strong></td>
</tr>
<tr>
<td>Continue to try an optimize operations.</td>
<td>S  Management SWAT</td>
</tr>
<tr>
<td>Abandon operations.</td>
<td>E  Operational Rationalization</td>
</tr>
<tr>
<td>Design Factor</td>
<td>Identify too many complimentary research activities</td>
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**Observation**
Too many areas for collaboration between disciplines may be identified, making it necessary to decide how to allocate scarce resources.

**Extension**
If the identification of complimentary lines of scientific inquiry is successful, the NSI will fulfill one of its primary missions. However, if the NSI is too successful, it may stretch past its capacity to carry out new and innovative research. If this is the case, the NSI must allocate decide which collaborations it can feasibly support. Furthermore, worthy areas of inquiry may be identified but may not make the "cut." These ideas should be preserved to be pursued later or by groups with sufficient resources.

The problem is one of selecting the collaborations that have the highest cost/benefit ratio compared to the others.

**Design Strategies**
- Have proposals for collaboration compete against each other.
- Save proposals that are not chosen.
- Limit the number of proposals submitted.
- Raise the quality of the proposals submitted.

**Solution Elements**
- Collaboration Competition
- NSI Proposals for Collaboration
- Open Proposals for Collaboration

**Sources**
Identify complimentary research activities
### Design Factor

<table>
<thead>
<tr>
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<th>Associated Functions</th>
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<tbody>
<tr>
<td>Natural Systems Institute</td>
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<td>128. Identify complimentary research activities</td>
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<tr>
<th>Originator</th>
<th>Sources</th>
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<td>Henning Fischer</td>
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### Observation

Identifying complimentary research activities within an organization is difficult. The right hand may not know what the left hand is doing.

### Extension

Large organizations often face the problem of knowledge management. They may have great collective knowledge, but have difficulty being aware of the knowledge in their possession. This may occur in areas that have the same focus as well as across disciplines. There may be obvious connections that could be made, but the awareness of the potential is the missing element.

The NSI will face a similar challenge as it begins to integrate disparate fields of study under its umbrella. For example, marine biologists may benefit greatly from collaboration with atmospheric scientists, but unless both sides can see the potential upsides of such a partnership, nothing may come of it.

The problem is one of awareness. There is little doubt that scientists will find fruitful areas for collaboration. The questions is how they will become aware of the possibility.

### Design Strategies

- Alert scientists of possible collaboration opportunities.
- List projects in central location.
- List competencies in central location.
- Match complementary research activities.
- Standardize descriptions.

### Solution Elements

- **S**: NSI Research Knowledge Net (NRK)
- **S**: Research Project Profiles (RPP)
- **S**: Research Skill Profile (RSK)
- **S**: Research Coordination Staff
- **S**: Research Profile Match
When sending out NSI representatives and presenting NSI findings to the public, it is difficult to get all departments’ input to disseminate complete knowledge and data.

Inter-departmental communication is a difficulty for many organizations. Often each department works on their individual tasks, only requesting information from other departments when a problem occurs. The result is incomplete information. For example, an economics department at a university that does not closely coordinate with the political science or the mathematics departments will end up spending considerably more time and being less prepared to present a cohesive document or presentation to the public.

Not coordinating with other departments is counterproductive and could lead to problems within an organization and how that organization is perceived by the public.
**Title:** Lack of means to apply definition in organization

**Observation**

Lack of means to apply definition in organization might result in low standard research to the NSI that might build some problems later.

**Extension**

Definition of each factor is important to do research. Lacks of appropriate means to define definition to the researchers might cause error in operation stages such as collecting wrong types of the animals or might cause higher cost to doing research by recollect the right information. Also, lack of attraction means cause inefficient workers in the institute.

Therefore, before doing the research, the NSI should apply the definition to overall workers in the organization. In order to inform the meaning and set the boundary or edge to over all factors, the NSI might use the former methods, do the experiment, or learn new methods from other organization.

**Design Strategies**

- Compare means with other org
- Testing means in small group

**Solution Elements**

- means search
- means experiment
- means search
- means experiment
### Title: Lacking knowledge to use tools

**Project**  
Natural Systems Institute

**Mode**  
Research

**Activity**  
Collecting

**Originator**  
Waewwan Sitthisathainchai

**Contributors**

<table>
<thead>
<tr>
<th><strong>Observation</strong></th>
<th><strong>Extension</strong></th>
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<tbody>
<tr>
<td>Lack of knowledge to use tools cause ineffective results, or might unintentionally destroy some information while operating data.</td>
<td>Using tools happens all the times of conducting research. Tools are all different in usages and types of each task, collecting, finding and gathering information. When users ignore or lack of knowledge to use tools in the right task, it might bring some problems to the tools conditions, information, and user themselves. The tools users might have not enough skill to operate tools because too much types of tools in each steps cause confusing to the tools operators.</td>
</tr>
</tbody>
</table>

**Design Strategies**  
- Leverage different regional tools abilities that appropriate to local area
- Inform users to match the right tools to the right tasks.

**Solution Elements**  
- 3 expertise responsible
- Prototype magazine
- Smart attribute scanner
- Classroom like locality

**Sources**  
Assemble & disassemble equipment  
Operate tool  
Gather data  
Gather sample

**Associated Functions**

---

Version: 2  
Date: November 20, 2005  
Date of Original: October 21, 2005
As the NSI’s mission is partially global, there will be a language barrier between the NSI and other chapters of the NSI and outside parties. Not everyone speaks the same language, though, and communication could therefore be difficult.

The NSI will hope to set up in as many countries as possible, as there is nowhere in the world that does not suffer from humans’ poor treatment of the environment. Not everyone speaks the same language, though, and communication could therefore be difficult.

**Design Strategies**
- Choose official language
- Invent new language
- Translators (people)
- Translators (computers)

**Solution Elements**
- E English
- S NSIme
- E Language corps
- S GeekSpeak
## Design Factor

**Project**
Natural Systems Institute

**Mode**
Administration - Oversight

**Activity**
Monitoring

**Originator**
Henning Fischer

### Observations
Insights are easier to obtain from data when the collection of data is done in a structured manner with later analysis in mind.

### Extension
Research protocols provide a framework for data collection that supports later analysis and synthesis. Data collection depends on what data is collected and how. The type of data that is desired should be determined before considering the most effective way to acquire it. For example, when surveying employee satisfaction, organizations generally wish to record the thoughts and feelings of their workers vis a vis the work environment. These are often collected through surveys and formal interviews with staff. The thoughts and feelings are the data, the surveys and formal interviews are elements of the research protocol.

An iteration-focused interface may be a possible point of departure.

The problem is one of matching the appropriate research method to the task at hand. Generally, this activity requires a degree of specialization and a thorough understanding of research methods, which may not always be available.

### Design Strategies
- Match the selected metrics to an appropriate method of observation
- Provide a list of research methods

### Solution Elements
- MetricAide

---

**Sources**
Personal observation

**Associated Functions**
Collect data

---

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<thead>
<tr>
<th>Design Factor</th>
<th>Unable to record data</th>
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<td>Administration - Oversight</td>
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<tr>
<td><strong>Activity</strong></td>
<td>Monitoring</td>
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<td><strong>Contributors</strong></td>
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</tr>
<tr>
<td><strong>Observation</strong></td>
<td>Data from observation, especially field observation, can be difficult to capture effectively for later analysis.</td>
</tr>
<tr>
<td><strong>Extension</strong></td>
<td>Observation yields large quantities of data. It can be quantitative, such as how much time it takes each employee to complete a task, or it can be qualitative, such as employee's remarks about working conditions. Both types of data are valuable when conducting management analysis. They can be difficult to record effectively though, especially when on the move. There are many alternatives for data recording, from audio and video recording devices to task oriented sensors that record only individual things, such as keystrokes. When doing both qualitative and quantitative research it often becomes difficult to keep all the observational data organized for later use. Moreover, some forms of data are far more portable than others. Digital data, in the form of files is relatively easy, while artifacts can be more challenging. The problem is one of capturing data in thoroughly and with adequate enough resolution to be of use during analysis.</td>
</tr>
</tbody>
</table>
| **Design Strategies** | Digitally record as much data as possible  
Store data that cannot be collected digitally in a centralized location  
Make data storage as portable as possible |
| **Solution Elements** | S | Management Memory |

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<table>
<thead>
<tr>
<th>Design Factor</th>
<th>Sources</th>
<th>Associated Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Project</strong></td>
<td></td>
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</tr>
<tr>
<td>Natural Systems Institute</td>
<td></td>
<td>Set methods/metric</td>
</tr>
<tr>
<td><strong>Mode</strong></td>
<td></td>
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<tr>
<td>Administration - Oversight</td>
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<tr>
<td><strong>Activity</strong></td>
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<tr>
<td>Henning Fischer</td>
<td></td>
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<tr>
<td><strong>Contributors</strong></td>
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</tbody>
</table>

**Observation**

When setting out to monitor or measure something, one must first determine the units with which that thing will be monitored or measured. If one chooses an inappropriate measure, the utility of the observation will be severely compromised.

**Extension**

Establishing appropriate measures when monitoring a process, performance or properties is a crucial first step in analyzing any given subject. However, determining the most appropriate unit or units of measure can be difficult in diverse situations, as there is a lack of standard measurements for many things, especially intangibles such as organizational effectiveness.

The problem is one one of choosing the appropriate metric for the task at hand.

**Design Strategies**

- Match thing to be measured with appropriate measurement metric.
- Match data to be measured with appropriate protocol.

**Solution Elements**

- AnalysisAide
- MetricAide
## Mishandling of samples

**Title:** Mishandling of samples

**Sources**
- Travel to site
- Establish monitoring range
- Measure variables
- Count specimens
- Collect samples
- Store samples

**Extension**

The diversity of the sample depends on types, species, characters and different area effect to the global research. The mishandling samples might cause difficulties to the collectors to move it efficiently without destroying or changing the natural cycle. Mishandling samples such as the heavy or big sample, live animals, might cause 10 times cost more than normal to collects those samples. Because the researchers should have the proper tools to move or reach those areas, they might find sample values, compare with similar sample and plan before collecting those samples to avoid losing money and time and also to not disturb natural environment unnecessary.

**Design Strategies**
- Separate data to small piece before moving
- Movable research center

**Solution Elements**
- Sample divider
- Movable research center

**Observation**

Mishandling sample cause problems such as losing or destroying samples or causing uncomplete data in research.
### Observation
Data has been collected, but the tools selected to analyze it are insufficient.

### Extension
Oftentimes data can be collected that represents a new category of observation that cannot be easily analyzed using existing tools. It becomes incumbent upon the user to create new methods of understanding the data.

Sometimes the user has data and has tools, but is looking for an outcome that the tool cannot provide. It could be provided by another tool, but he (or she) is not aware of it and therefore becomes stuck in the problem.

The problem is one of identifying which analysis method is most suitable for the desired outcome. If there is none, the user then must create a new framework.
**Design Factor**

<table>
<thead>
<tr>
<th>Project</th>
<th>Sources</th>
<th>Associated Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Systems Institute</td>
<td></td>
<td>149. Identify Issues</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Mode</th>
<th>Activity</th>
<th>Observation</th>
<th>Extension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integration - Operations</td>
<td>Supporting</td>
<td>What should be monitored?</td>
<td>The first step of any research effort is to determine the questions to be answered. However, there may be multiple and even conflicting questions that the researcher may want to answer. One could compare the questions and decide on the most important issues and then pursue them in order of importance.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Design Strategies</th>
<th>Solution Elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compare questions against each other and determine which is most important.</td>
<td>S Issue Monitoring Decision Tree</td>
</tr>
<tr>
<td>Systematically go through issues from most important to least important</td>
<td></td>
</tr>
</tbody>
</table>

Version: 1  Date: October 18, 2005  Date of Original: October 18, 2005
When setting out to monitor or measure something, one must first determine the units with which that thing will be monitored or measured. If one chooses an inappropriate measure, the utility of the observation will be severely compromised.

Establishing appropriate measures when monitoring a process, performance or properties is a crucial first step in analyzing any given subject. However, determining the most appropriate unit or units of measure can be difficult in diverse situations, as there is a lack of standard measurements for many things, especially intangibles such as organizational effectiveness.

The problem is one of choosing the appropriate metric for the task at hand.
**Observation**

Objective performance standards are hard to set.

**Extension**

Performance standards are hard to set. Set them too high and you create a failure prone environment, which can easily demoralize teams. Set them too low and you encourage complacency. The goal is to create standards that are high enough to push teams past their natural ability and encourage them to learn, while still being realistic.

The problem is one of calibration.

**Design Strategies**

Ensure that standards are set according to what has been observed during monitoring.

Set standards that are neither too high nor too low.

**Solution Elements**

S Performance Analysis and Standards Staff
### Design Factor

**Title:** Outside work does not align with NSI mission

<table>
<thead>
<tr>
<th>Project</th>
<th>Sources</th>
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</thead>
<tbody>
<tr>
<td>Natural Systems Institute</td>
<td>Team deliberations</td>
<td>Publish others’ work</td>
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<th>Activity</th>
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<tbody>
<tr>
<td>External Relation</td>
<td>Promulgating</td>
<td>Mark King</td>
<td></td>
</tr>
</tbody>
</table>

#### Observation

It is difficult to identify and choose others’ work that would properly align with the NSI mission.

#### Extension

In order to get good coverage of scientific ideas and cultural trends, the NSI will publish the work of people outside the organization. When we do this, it will sometimes be difficult to clearly define what kind of information we need, as well as if it will be properly aligned with our mission.

Additionally, we do not want to alienate people who are important to our cause by not publishing their work or modifying it to suit our desires.

<table>
<thead>
<tr>
<th>Design Strategies</th>
<th>Solution Elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Publishing panel</td>
<td>E Panel of esteemed colleagues</td>
</tr>
<tr>
<td>Call for abstracts</td>
<td>E Call for abstracts</td>
</tr>
<tr>
<td>Sabbatical works</td>
<td>S Sabbatical publishing</td>
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## Design Factor

<table>
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<tr>
<td>Natural Systems Institute</td>
<td>Team deliberations</td>
<td>host static exhibits</td>
</tr>
</tbody>
</table>

**Mode**  
Education

**Activity**  
Attracting

**Originator**  
Matthew Lennertz

**Contributors**  

### Observation

It is difficult to identify and choose others’ work that would properly align with the NSI mission.

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In order to get good coverage of scientific ideas and cultural trends, the NSI will publish the work of people outside the organization. When we do this, it will sometimes be difficult to clearly define what kind of information we need, as well as if it will be properly aligned with our mission.

Additionally, we do not want to alienate people who are important to our cause by not publishing their work or modifying it to suit our desires.

### Design Strategies

- Publishing panel
- Call for abstracts
- Sabbatical works

### Solution Elements

- E  Panel of esteemed colleagues
- E  Call for abstracts
- S  Sabbatical publishing
## Design Factor

### Title: NSI image is unclear

<table>
<thead>
<tr>
<th>Project</th>
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<tbody>
<tr>
<td>Natural Systems Institute</td>
<td>Team deliberations</td>
<td>Present NSI image</td>
</tr>
</tbody>
</table>

### Mode

- Education

### Activity

- Attracting

### Originator

- Matthew Lennertz

### Contributors

### Observation

If the image of an institution is unclear it can hamper the effectiveness of its programs.

### Extension

There are a number of environmental organizations that struggle with images that are unclear and misunderstood. If the NSI is able to clarify its image it will retain a steady level of visitors and have the opportunity to make considerable ground in the fight against global warming.

### Design Strategies

- Standardize image
- Communicate image clearly
- Differentiate image from others

### Solution Elements

- S Image definer
- S Ima-clear
Title: Old strategies are no longer effective

### Design Factor

<table>
<thead>
<tr>
<th>Project</th>
<th>Natural Systems Institute</th>
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<tr>
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<td>Matthew Lennertz</td>
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<td>Contributors</td>
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</table>

### Observation
As the world changes and people continue to encroach across the globe, previous strategies may no longer function as effectively as before.

### Extension
With the rapid expansion of human population centers, challenges to the current group of strategies will become readily apparent. The NSI will be at the forefront of the fight to maintain the environment and conserve resources. If it does not develop new strategies as the environment and circumstances change then they will be rendered ineffective.

### Design Strategies
- Determine ineffective strategies
- Identify possible strategies
- Chart unclear strategy directions

### Solution Elements
- E Group Meetings
- S Strategy Cauldron
- S Strate-gation
## Design Factor

### Project
Natural Systems Institute

### Mode
Integration - Operations

### Activity
Conducting

### Originator
Henning Fischer

### Contributors

### Observation
Operations often times include members with no previous experience that require assistance.

### Extension
There's a first time for everything, especially in science. Newer or less experienced team members may not have the required skill sets to establish a proper operation (or field site), but may be asked to do so nonetheless.

The problem is one of learning on the job.

### Design Strategies
- Provide a complete list of instructions
- Provide a guide to lead people through most situations

### Solution Elements
- **S** NSI Field Operations Manual
<table>
<thead>
<tr>
<th>Design Factor</th>
<th>Maintenance equipment inadequate</th>
</tr>
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<table>
<thead>
<tr>
<th><strong>Project</strong></th>
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<tr>
<th><strong>Observation</strong></th>
<th>Operation staff may not be enough to complete set up.</th>
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<table>
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<tr>
<th><strong>Extension</strong></th>
<th>Manpower shortages generally have two consequences. First, the project may not be competed on time. The people present at the site may simply be unable to complete the work. Second, the team on site may be able to complete the work, but at considerable expense to themselves as well as the quality of the job.</th>
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</table>

The problem is one of allocating the correct amount of resources.

<p>| <strong>Design Strategies</strong> | | <strong>Solution Elements</strong> |
|-----------------------||----------------------|
| Allocate the correct number of people to a project. | | S NSI Project Management |
| Scale back operational demands | | S Operational Scale Back Plans |</p>
<table>
<thead>
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<th>Design Factor</th>
<th>Sources</th>
<th>Associated Functions</th>
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</thead>
<tbody>
<tr>
<td>Project</td>
<td>Natural Systems Institute</td>
<td>Set up operation</td>
</tr>
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<td>Mode</td>
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Operation staff may not be enough to complete set up.

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### Design Strategies
- Allocate the correct number of people to a project.
- Scale back operational demands

### Solution Elements
- S NSI Project Management
- S Operational Scale Back Plans

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<table>
<thead>
<tr>
<th>Design Factor</th>
<th>Title: People are apathetic</th>
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<tr>
<td>Project</td>
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<td>Matthew Lennertz</td>
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### Observation
Many people are apathetic to the conditions of the natural world.

### Extension
There may not be a cure-all solution for the apathy that afflicts large swaths of the population, however it is possible to better communicate the institute’s goals and capture the attention of a larger portion of the populace.

### Design Strategies
- Create excitement about NSI

### Solution Elements
- S Eco-party
- S NSI Vibe
- S NSI Live

### Associated Functions
- Stimulate interest

### Sources
- Team deliberations
<table>
<thead>
<tr>
<th>Design Factor</th>
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</thead>
<tbody>
<tr>
<td><strong>Project</strong></td>
<td>Team deliberations</td>
<td>Promote NSI awareness</td>
</tr>
<tr>
<td>Natural Systems Institute</td>
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<tr>
<td><strong>Mode</strong></td>
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<tr>
<th><strong>Design Strategies</strong></th>
<th><strong>Solution Elements</strong></th>
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<tbody>
<tr>
<td>Non-traditional awareness program</td>
<td>S NSI Roots</td>
</tr>
<tr>
<td>heavy web presence</td>
<td>S NSI web</td>
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<tr>
<td>Design Factor</td>
<td>Title: People attempt to touch flaura or fauna</td>
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<td>---------------</td>
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<tr>
<td><strong>Project</strong></td>
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</tr>
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<td>Matthew Lennertz</td>
</tr>
<tr>
<td><strong>Contributors</strong></td>
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</tbody>
</table>

### Observation
People may attempt to enter exhibits and other dangerous areas.

### Extension
There are people that are curious and others that do not know how to behave in an environment containing captive wild animals and flaura. Clearly defined barriers will help minimize the chance of injury to the visitors and damage to the captive specimens.

### Design Strategies
- Design distinct barriers
- Incase all exhibits in glass
- Develop exhibit systems

### Solution Elements
- S Persa-barrier
- S Clarity-closure
- S Xibit
### Design Factor

**Title:** People don't share NSI's values

<table>
<thead>
<tr>
<th>Project</th>
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</thead>
<tbody>
<tr>
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<tbody>
<tr>
<td>Education</td>
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<td>Matthew Lennertz</td>
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</tbody>
</table>

### Design Strategies

- Communicate values
- Provide ownership of values

### Solution Elements

- S NSIdea
- S NSI share

### Observation

There are individuals that will not share the NSI's values.

### Extension

It is a challenge to gain adherents to your value system. While attempting to avoid the cult-like demeanor of many environmental groups, it is in the Institute's best interest to have as many people accept and share their values as possible.
<table>
<thead>
<tr>
<th>Design Factor</th>
<th>Title: Programs are difficult to evaluate</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Project</strong></td>
<td>Natural Systems Institute</td>
</tr>
<tr>
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<tr>
<td><strong>Contributors</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Observation</strong></td>
<td>Any institution that offers educational programs faces the task of assessing the effectiveness of the programs. This may be a difficult task.</td>
</tr>
<tr>
<td><strong>Extension</strong></td>
<td>The evaluation of educational programs has been long debated and there is no single correct solution to evaluate a program's effectiveness. This difficulty does not however, preclude the institute from the need. It must develop its own system to determine the efficiency of individual programs.</td>
</tr>
<tr>
<td><strong>Design Strategies</strong></td>
<td>Develop evaluation program, Standardize expectations</td>
</tr>
<tr>
<td><strong>Solution Elements</strong></td>
<td>S Cornerstone, S Resultnt</td>
</tr>
<tr>
<td><strong>Sources</strong></td>
<td>Team deliberations</td>
</tr>
<tr>
<td><strong>Associated Functions</strong></td>
<td>Evaluate programs</td>
</tr>
</tbody>
</table>
## Title: Project responsibilities are unclear

### Design Factor

**Project**  
Natural Systems Institute

**Mode**  
Education

**Activity**  
Managing

**Originator**  
Matthew Lennertz

**Contributors**

---

### Observation

Because of the size of the NSI it is difficult for staff and management to delineate their individual and group responsibilities.

### Extension

The complexity of the projects the Institute will engage in will require an extensive level of discipline and cooperation within and between teams. More importantly, it will be necessary for managers and staff to understand their responsibilities. If the members of the project do not understand this, they run the risk of wasting valuable time and energy duplicating work or missing important components of the project.

### Design Strategies

- Tie responsibility to incentives
- Publicize responsibility
- Avoid micro-management

### Solution Elements

- E Performance reviews
- S Project-track
- E Lead role

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**Version:** 1  
**Date:** October 17, 2005  
**Date of Original:** October 17, 2005
**Design Factor**

**Title:** Lack of public interest

<table>
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<tr>
<th>Project</th>
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<th>Associated Functions</th>
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<tbody>
<tr>
<td>Natural Systems Institute</td>
<td>Team deliberations</td>
<td>Generate media coverage</td>
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</table>

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<tr>
<th>Mode</th>
<th>Activity</th>
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</thead>
<tbody>
<tr>
<td>External Relations</td>
<td>Exporting influence</td>
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</table>

<table>
<thead>
<tr>
<th>Observation</th>
<th>Extension</th>
</tr>
</thead>
<tbody>
<tr>
<td>The media will not pay attention to the NSI if the public does not care.</td>
<td>The NSI is reliant on the public’s support in order to halt detrimental environmental trends. One way for us to get support and explain our message is through media coverage (magazines, newspapers, television, etc.). However, most media outlets are committed to their audiences, and if the NSI is not interesting to their segment, we will not be able to generate sufficient media coverage. The NSI is not all about the mission: it must appeal to the people and inspire them to want to help.</td>
</tr>
</tbody>
</table>

**Design Strategies**

- Good PR
- Interesting message
- Interesting presentation
- Media kits
- Partnerships with orgs. that have good media coverage

**Solution Elements**

- E Eco-Relations
- M Strategic partnering
### Observations

Not well preserve sample cause losing data to the research project and might increase task by recollect sample

### Extensions

Some natural samples are perishable. There are many reason that sample is not preserve properly. First, the sample is hardly preserve in human environment. Some sample such as live animals or trees might hard to preserve. In this case, the scientist should control times and surrounding to keep these sample carefully.

Second, the researchers don’t know how to collect sample in the proper way. In this case, the researchers or sample collectors should be informed right methods and practise before collecting sample to reduce destroyed to the natural environment.

Third, the researchers don’t have proper tools to using in collecting and keeping samples. In this case, the NSI might offer each research center proper tools and also let the local create tools that proper to each environments.

### Design Strategies

- Define and apply the proper surrounding
- Collect sample again
- Design moving method

### Solution Elements

- Fence control
- Recollect sam
- moving concern
## Design Factor

**Project**  
Natural Systems Institute

**Mode**  
External Relations

**Activity**  
Exporting influence

**Originator**  
Mark King

### Design Strategies

- Specialized curricula
- Off-site visits representative to kids
- Advertising
- Partnerships with youth/teen-oriented activities and groups
- Specialized newsletters

### Solution Elements

- E  
  NSI curriculum
- M  
  Ecoman
- M  
  NSI Ads
- M  
  Synergy
- M  
  Eco-Times

### Observations

Many students do not have the desire, energy, knowledge, or will to care about the environment.

### Extension

Accessing students is a very difficult thing, yet vitally important to the NSI’s mission. Young children can rally behind causes, but they are at the mercy of their parents and rarely truly understand what they are doing.

Older students, while frequently able to comprehend issues, often do not have the energy or desire to do anything about them.
Design Factor

Project
Natural Systems Institute

Mode
Administration - Operations

Activity
Supporting

Originator
Henning Fischer

Contributors

Observation
Settling up research sites often involves building things, which requires the appropriate tools for the job.

Extension
The ability to set up field research sites is oftentimes limited by the available tools at hand to aid in the establishment of the site. This is particularly the case when field research sites are remote. Lost or forgotten tools can critically slow a site's establishment if equipment cannot be set up without them.

The problem is one of having the right tools for the job at hand.

Design Strategies

- Incorporate tool storage into transport containers.
- Have operations planners specify tools required for set up.
- Multifunctional tools that can serve as back ups for tools that are not at hand.

Solution Elements

- S  BuildPak
- E  Operations Manual
- M  MultiTools

Version: 1  Date: September 13, 2005  Date of Original: September 13, 2005
Title: Unable to reach target audience

Various factors can prohibit the NSI's message from reaching its intended audience(s).

1. Lack of internet access
2. Illiteracy
3. Community disinterested
4. Poor physical location

The NSI will rely heavily on community involvement, word of mouth, and advertising to spread the NSI's mission and recruit people to help. However, if these messages cannot get through, the messages themselves become worthless. Some hindrances to this include:

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<thead>
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<th>Design Strategies</th>
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</thead>
<tbody>
<tr>
<td>Community outreach</td>
<td>E Community coordination</td>
</tr>
<tr>
<td>Location planning</td>
<td>E Site surveyors</td>
</tr>
<tr>
<td>Simple seminars</td>
<td>M Simple seminars</td>
</tr>
<tr>
<td>Variety of media outlets</td>
<td>E Blanket advertising campaign</td>
</tr>
<tr>
<td>Design Factor</td>
<td>Title: Too many departments to coordinate</td>
</tr>
<tr>
<td>---------------</td>
<td>------------------------------------------</td>
</tr>
<tr>
<td><strong>Project</strong></td>
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<tr>
<td><strong>Mode</strong></td>
<td>External Relations</td>
</tr>
<tr>
<td><strong>Activity</strong></td>
<td>Promulgating</td>
</tr>
<tr>
<td><strong>Originator</strong></td>
<td>Mark King</td>
</tr>
<tr>
<td><strong>Contributors</strong></td>
<td></td>
</tr>
</tbody>
</table>

**Observation**

Many fragile artifacts and objects are at risk of being damaged when transporting them from one location to another to show audiences the NSI mission.

**Extension**

There are many materials used for packing costly, fragile, or precious goods that the NSI could use, but they are generally not environmentally-friendly. As the NSI is committed to preserving the environment and not creating further harm, it will have to create a system of packing methods and materials that will safely transport their exhibits to their next destination that will fall in line with their mission.

**Design Strategies**

- Create environmentally-friendly packing materials
- Control transport in every step

**Solution Elements**

- M EcoPack
- E NSItransport

Version: 2

Date: October 3, 2005

Date of Original: October 1, 2005
**Design Factor**

**Title:** Unable to formulate research plan

<table>
<thead>
<tr>
<th><strong>Project</strong></th>
<th>Natural Systems Institute</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mode</strong></td>
<td>Research</td>
</tr>
<tr>
<td><strong>Activity</strong></td>
<td>Defining</td>
</tr>
<tr>
<td><strong>Originator</strong></td>
<td>Waewwan Sitthisathainchai</td>
</tr>
<tr>
<td><strong>Contributors</strong></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Sources</strong></th>
<th><strong>Associated Functions</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Define problem</td>
</tr>
<tr>
<td></td>
<td>Set the hypothesis</td>
</tr>
<tr>
<td></td>
<td>Identify strategy</td>
</tr>
<tr>
<td></td>
<td>Devise method</td>
</tr>
<tr>
<td></td>
<td>Set definition</td>
</tr>
<tr>
<td></td>
<td>Apply definition</td>
</tr>
<tr>
<td></td>
<td>Choose environment</td>
</tr>
<tr>
<td></td>
<td>Define interpretation method</td>
</tr>
</tbody>
</table>

**Observation**

Unable to formulate plan cause poorly organizing to research project that may bring some problems such as losing time, unworkable method or the lack of link between the each research level.

**Extension**

The research plan helps the scientists to control the results of the research on times. Plan cannot be formulated might because the research project is too broad. Too much level on variable in the research models might also lead to confusion of the person who identify the strategy. The research methods are not accept worldwide or lack of the method that prove the good results.

**Design Strategies**

- Reduce NSI size project
- Link project

**Solution Elements**

- project divider
- project linkage

Version: 2  
Date: November 20, 2005  
Date of Original: October 21, 2005
### Design Factor

<table>
<thead>
<tr>
<th>Project</th>
<th>Natural Systems Institute</th>
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</thead>
<tbody>
<tr>
<td><strong>Mode</strong></td>
<td>Research</td>
</tr>
<tr>
<td><strong>Activity</strong></td>
<td>Defining</td>
</tr>
<tr>
<td><strong>Originator</strong></td>
<td>Waewwan Sitthisathainchai</td>
</tr>
<tr>
<td><strong>Contributors</strong></td>
<td></td>
</tr>
</tbody>
</table>

**Sources**
- Define problem
- Set the hypothesis
- Identify strategy
- Devise method
- Set definition
- Apply definition
- Choose environment
- Define interpretation method

**Associated Functions**

**Observation**
Unable to set hypothesis lead confusion to the research direction and increase confusion and uncertainty to the project.

**Extension**
To set hypothesis is an important level of science study to guide and set the boundary to create problem solving. Research is a part of the science study to prove the hypothesis, then research without hypothesis conduct too broad purpose, and not constructive structure that may result time lose and resource.

Hypothesis is the tool to helps researcher to understand and bound project results. Sometimes the scientists cannot set the hypothesis because they don't have enough knowledge or information. Lacking of confidence, creativity, or experiences also result the inability to set the hypothesis.

Moreover, to set unreasonable hypothesis also bring problems to the research by following in the wrong direction or unworthy.

**Design Strategies**
- Learn from case study
- Let the young scientists learn from the older scientist
- Set the hypothesis brainstorming
- Increase knowledge and experience to the scientists
- Recruit experts

**Solution Elements**
- Case comparing
- Case database
- Ages triple
- Expert wanted

Version: 2
Date: November 20, 2005
Date of Original: October 21, 2005
<table>
<thead>
<tr>
<th>Design Factor</th>
<th>Sources</th>
<th>Associated Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Project</strong></td>
<td>Team deliberations</td>
<td>Generate media coverage</td>
</tr>
<tr>
<td>Natural Systems Institute</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Mode</strong></th>
<th><strong>Activity</strong></th>
<th><strong>Originator</strong></th>
<th><strong>Contributors</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>External Relations</td>
<td>Establishing partnerships &amp; benefactors</td>
<td>Mark King</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Observation</strong></th>
<th><strong>Extension</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>When trying to establish organizations and people with whom to partner, it can be difficult to identify and contact decision-makers.</td>
<td>The NSI will set up partnerships with different organizations, both in terms of money and information sharing. Many times it is difficult to find and maintain a relationship with the decision-makers in order to establish and continue our relationship.</td>
</tr>
</tbody>
</table>

**Design Strategies**
- Sponsorship mediator
- Limited partnerships
- Celebrity liaison
- Board meetings at NSI at fixed times

**Solution Elements**
- E Partner mediator
- E Selective partnerships
- M Celebrity liaison
- E Eco-meetings
**Title:** Unable to reach intended audience

**Design Strategies**

- Community involvement
- Partner with design institutions known for doing this type of work
- Public relations
- Surveys
- Interviews

**Solution Elements**

- S Community liaison
- S Environmental issues census

**Observation**

It is vitally important that the NSI tailor its mission for its intended audience in order to make its message clear.

**Extension**

The NSI will be targeting many different groups with different sorts of media. We might target school children with videos, scientists with research articles, or working adults with a newsletter. Each segment of the population will have different needs and wants, and the NSI must accommodate them.

The message from the NSI is so important, yet it will be difficult to make everyone “hear” what we are saying. For this reason, great care must be taken to ensure that each segment that we target will have powerful, interesting, and reliable data, as well as inspiring for their interests and needs.
Unskilled observers cause lacking of information, unreliable research and might cause dangerous to themselves while operating research.

The observers’ skill in research is the main factors in observing level because the observers use their abilities to observe and recorded data to the research. Also, they might cause problem to the overall natural systems by unintentionally disturbing. There are may reason that result unskilled observers.

First, there are lacks of teaching and practicing workers methods in the NSI before conducting research. The observers should practice to use their sensitiveness. The workers who lack of this observing skill might face the hard time to observe things around themselves.

Second, there are lacks of interesting of the observers while practicing how to observe. In this case, the NSI might improve the teaching methods, or recruit people who interest to work for the NSI.

Third, the workers don’t have enough experiences in observing things. They might need some suggestion form others.

Originator
Waewwan Sitthisathainchai

Contributors

Design Strategies

- Acknowledge observers before observe
- Set group of observers that have skill
- Practice the observers skill
- Use tools instead of the observers skill

Solution Elements

- Kick off meeting
- Ages triple

Sources

- Travel to site
- Establish monitoring range
- Measure variables
- Count specimens
- Collect samples
- Store samples

Version: 2  Date: November 20, 2005  Date of Original: October 21, 2005
<table>
<thead>
<tr>
<th>Design Factor</th>
<th>Title: Visitors don’t know what/how to take action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project</td>
<td>Natural Systems Institute</td>
</tr>
<tr>
<td>Mode</td>
<td>Education</td>
</tr>
<tr>
<td>Activity</td>
<td>Orienting</td>
</tr>
<tr>
<td>Originator</td>
<td>Matthew Lennertz</td>
</tr>
<tr>
<td>Contributors</td>
<td></td>
</tr>
<tr>
<td>Sources</td>
<td>Team deliberations</td>
</tr>
<tr>
<td>Associated Functions</td>
<td>Make Advisories</td>
</tr>
</tbody>
</table>

**Observation**

Many people fail to act because they do not know how or what to do.

**Extension**

If the NSI makes advisories, it will provide people with guidance. This guidance may prove to be the simplest key to motivating a public that is otherwise inactive.

**Design Strategies**

- Provide action plans
- Suggest positive alternatives

**Solution Elements**

<table>
<thead>
<tr>
<th></th>
<th>S Ecoplan</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>S AlterNSI</td>
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</tbody>
</table>

Version: 1  Date: October 17, 2005  Date of Original: October 17, 2005
In Defining process, the strategy person should assume what they know and know what they don't know to avoid the deteriorate from apply what they do not know to the strategy. There are a lot of people in the research department who conducted research by lot of data all the time. In some case, the scientists ignore to determine what they know because they do not know or unsure to determine enough data. Moreover, lack of criteria to decide and time to process are also the reason that obstruct this determination. To identify strategy, the scientist should assess the information they have and information that they lack to identify the method that proper to the information they want such as should they research more, or should they concentrate on analysis data that they already have.
**Design Factor**

<table>
<thead>
<tr>
<th>Project</th>
<th>Natural Systems Institute</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mode</td>
<td>Research</td>
</tr>
<tr>
<td>Activity</td>
<td>Reporting</td>
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<tr>
<td>Originator</td>
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<td>Contributors</td>
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</table>

<table>
<thead>
<tr>
<th>Sources</th>
<th>Associated Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Define issue</td>
</tr>
<tr>
<td></td>
<td>Describe issue</td>
</tr>
<tr>
<td></td>
<td>Coordinate findings</td>
</tr>
<tr>
<td></td>
<td>Compile info into document</td>
</tr>
<tr>
<td></td>
<td>Create document</td>
</tr>
<tr>
<td></td>
<td>Distribute document</td>
</tr>
<tr>
<td></td>
<td>Make problem known</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Observation</th>
</tr>
</thead>
<tbody>
<tr>
<td>If worldwide distribution is expensive, it obstruct the NSI to promote and spread out important information to every parts of the world that might cause ineffective results to overall project.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Extension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Because the NSI think globally and work locally, the global issue and how to share out is very important to the NSI. After finishing research, the NSI has a role to make it take place on the physically world. However, the global issues can not be solved by just one or two groups; instead, the NSI has to build lots of attention from the whole by sending message to all communities.</td>
</tr>
</tbody>
</table>

Medias are the important factors to levels. Because media is depends on community, The NSI has to controls the cost by using the most proper and powerful media that is not too much expensive. The high cost expenditure in printing and broadcasting might block other distribution methods. The NSI might use it connection by communities itself to support this issues. |

<table>
<thead>
<tr>
<th>Design Strategies</th>
<th>Solution Elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supported by government</td>
<td>Falcon wing</td>
</tr>
<tr>
<td>Use the NSI network or partnerships</td>
<td>Lion crawl</td>
</tr>
</tbody>
</table>

**Version:** 2  
**Date:** November 20, 2005  
**Date of Original:** October 21, 2005
E: Information Structure
Information Structure
F: Sample Working Forms
**Activity Analysis**

**Activity:** Instructing

**Project:** Natural Systems Institute

**Mode**

<table>
<thead>
<tr>
<th>Submode</th>
<th>Conservation</th>
<th>Restoration</th>
</tr>
</thead>
</table>

**Originator**

Joyce Chen

**Contributors**

7 Oct 2005 Mark King

**Users**

- Scientists/researchers
- Managers
- Liaisons

**System Components**

- Computers
- Database software
- Email
- Websites

**Environmental Components**

- Office
- Natural spaces, i.e. fisheries, reefs, mountain ranges, grasslands, lakes, ponds, forests, etc.

**Functions**

- Requisition support
- Oversee restoration
- Reestablish NSI resources

**Associated Design Factors**

- Lack of support
- Research partners want to oversee themselves
- Resources cannot be reestablished

Because the NSI will utilize its partnerships to restore resources, its primary role will be to oversee restoration and provide support to independent local and regional groups.
### Activity Analysis

<table>
<thead>
<tr>
<th><strong>Activity</strong>: Modifying</th>
</tr>
</thead>
</table>

**Project**
Natural Systems Institute

**Mode**
Conservation

**Submode**
Transformation

**Originator**
Joyce Chen

**Contributors**

<table>
<thead>
<tr>
<th><strong>Users</strong></th>
<th><strong>System Components</strong></th>
<th><strong>Environmental Components</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Scientists/researchers</td>
<td>Chemicals</td>
<td>Natural spaces, i.e. fisheries, reefs, mountain ranges, grasslands, lakes, ponds, forests, etc.</td>
</tr>
<tr>
<td>Managers</td>
<td>Construction tools and machinery</td>
<td>Office space</td>
</tr>
<tr>
<td>Construction/field workers</td>
<td>Computers and software</td>
<td>Laboratories</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Functions</strong></th>
<th><strong>Associated Design Factors</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Convert structures</td>
<td>Structures too fragile to convert</td>
</tr>
<tr>
<td>Redefine values</td>
<td>Political barrier or other objection</td>
</tr>
<tr>
<td>Integrate functions</td>
<td>Disagreement on how values should be redefined</td>
</tr>
<tr>
<td></td>
<td>New functions are not easily integrated</td>
</tr>
</tbody>
</table>
A robot that performs natural resource inventory for the NSI and is capable of outputting formatted information to the Virtual Resources Library.

### Properties

- A powerful software tool
- A mobile, self-sufficient robot
- A data collector and processor
- A huge collection of sensors
- Artificially intelligent
- Maintained by the Inventory Bot Research Group (IBoRG)
- A scanner
- A large computer with limited storage capacity but superior processing capabilities

### Features

- Gathers environmental data by connecting with remote sensors and reading output from Aurora Database
- Travels throughout each regional office to read output from various sensors
- Maintains an inventory of all resources belonging to the NSI
- Can be programmed by IBoRG to collect all sorts of data
- Organizes the data into a searchable database, outputting this information into the Virtual Resource Library
- Reads OCR documents
- Organizes the inventory based on a series of algorithms to help it categorize each piece of data
- Constantly updates itself, keeping track of different versions
**Solution Element**

<table>
<thead>
<tr>
<th>Project</th>
<th>Natural Systems Institute</th>
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</thead>
<tbody>
<tr>
<td><strong>Mode</strong></td>
<td>Conservation</td>
</tr>
<tr>
<td><strong>Submode</strong></td>
<td>Maintenance</td>
</tr>
<tr>
<td><strong>Activity</strong></td>
<td>Maintaining</td>
</tr>
<tr>
<td><strong>Originator</strong></td>
<td>Joyce Chen</td>
</tr>
</tbody>
</table>

**Description**

An online library containing all known information about every NSI resource, for easy access from all over the world.

**Source**

- Various University online libraries
- Google Earth (http://earth.google.com)

**Properties**

- A database of natural resource information
- A resource for students
- An organized repository for scientific studies
- Electronic journals
- Electronic books
- Network of websites
- Catalog of contents

**Features**

- Database searchable by author, title, topic, location, species, date, continent, country, etc.
- Easy-to-use virtual interface for navigating the library
- Uses multimedia to demonstrate and teach about ongoing and completed studies
- Uses multimedia to educate students about global environments
- Well-tested information architecture helps users find exactly what they are looking for
- Paying members of NSI can download electronic copies of published journals
- Links to conferences, curricula, seminars, maps, and partner institutions/organizations
- Offers virtual tours of NSI headquarters and regional facilities
- Free library “card” allows temporary free access to copyrighted materials
- Enables users to take “virtual” tours across the surface of the world and deep into the seas
<table>
<thead>
<tr>
<th>Functions</th>
<th>Means</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>Communicate benefits</td>
</tr>
<tr>
<td>163</td>
<td>Direct visitors</td>
</tr>
<tr>
<td>165</td>
<td>Conduct tours</td>
</tr>
<tr>
<td>166</td>
<td>Conduct classes</td>
</tr>
<tr>
<td>12</td>
<td>Communicate benefits</td>
</tr>
<tr>
<td>17</td>
<td>Create website</td>
</tr>
<tr>
<td>19</td>
<td>Disseminate knowledge</td>
</tr>
<tr>
<td>20</td>
<td>Engage policy-makers</td>
</tr>
<tr>
<td>22</td>
<td>Engage students</td>
</tr>
<tr>
<td>23</td>
<td>Coordinate local projects</td>
</tr>
<tr>
<td>25</td>
<td>Recruit organization</td>
</tr>
<tr>
<td>26</td>
<td>Recruit people</td>
</tr>
<tr>
<td>169</td>
<td>Stimulate interest</td>
</tr>
<tr>
<td>25</td>
<td>Recruit organization</td>
</tr>
<tr>
<td>26</td>
<td>Recruit people</td>
</tr>
<tr>
<td>28</td>
<td>Identify organizations &amp; people</td>
</tr>
<tr>
<td>29</td>
<td>Present mission &amp; research</td>
</tr>
<tr>
<td>30</td>
<td>Illustrate benefits for partners</td>
</tr>
<tr>
<td>175</td>
<td>Advertise NSI experience</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ends</th>
<th>Means</th>
</tr>
</thead>
<tbody>
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<td>109</td>
<td>Managing visitors</td>
</tr>
<tr>
<td>110</td>
<td>Generating outside interest</td>
</tr>
<tr>
<td>111</td>
<td>Attracting partnerships</td>
</tr>
<tr>
<td>205</td>
<td>Public relations</td>
</tr>
<tr>
<td>206</td>
<td>Self-promotion</td>
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</table>

<table>
<thead>
<tr>
<th>End</th>
</tr>
</thead>
<tbody>
<tr>
<td>304</td>
</tr>
</tbody>
</table>

### Means/Ends Analysis

**Cluster:** 304

**Project:** Natural Systems Institute
Cluster: 321

Project:
Natural Systems Institute

Ends/Means Synthesis
Ends/Means Synthesis

Project: Natural Systems Institute

Cluster: 322 Systems Operations

Ends
- Recruit candidates
- Evaluate candidates
- Establish organization culture and rules
- Provide feedback
- Need to know what we need
- Need financial resources
- Identify strategy
- Monitoring status
- Personnel/tools

Means
- Systems Operations
- Hire and manage personnel
- Tools/materials/resources for performing operations
- Procedures for planning out operations
- Procedures for realizing operations
- Maintain facilities

System Elements
- NSI Street Team
- Job opportunities website
- RecruitNSI
- Core values
- C3: Company Culture Committee
- Triage
- Donor relations
- Strategy Round Table
- Plant engineering staff
- Department of Plant Operations (DOPO)
### System Elements

<table>
<thead>
<tr>
<th>Features</th>
<th>NSI Publications</th>
<th>Toolkit</th>
<th>Event Planning Office</th>
</tr>
</thead>
<tbody>
<tr>
<td>51</td>
<td>Establish viewpoint</td>
<td>![Strongly supports fulfillment of the Function]</td>
<td>![Strongly supports fulfillment of the Function]</td>
</tr>
<tr>
<td>52</td>
<td>Compare data with viewpoint</td>
<td>![Strongly supports fulfillment of the Function]</td>
<td>![Strongly supports fulfillment of the Function]</td>
</tr>
<tr>
<td>53</td>
<td>Distill data into recommendation</td>
<td>![Strongly supports fulfillment of the Function]</td>
<td>![Strongly supports fulfillment of the Function]</td>
</tr>
<tr>
<td>104</td>
<td>Compare method</td>
<td>![Supports fulfillment of the Function]</td>
<td>![Supports fulfillment of the Function]</td>
</tr>
<tr>
<td>105</td>
<td>Analyze data</td>
<td>![Supports fulfillment of the Function]</td>
<td>![Supports fulfillment of the Function]</td>
</tr>
<tr>
<td>107</td>
<td>Search for errors</td>
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<td>![Supports fulfillment of the Function]</td>
</tr>
<tr>
<td>108</td>
<td>Identify missing data</td>
<td>![Supports fulfillment of the Function]</td>
<td>![Supports fulfillment of the Function]</td>
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<tr>
<td>109</td>
<td>Draw conclusion</td>
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<td>![Supports fulfillment of the Function]</td>
</tr>
<tr>
<td>110</td>
<td>Evaluate information</td>
<td>![Supports fulfillment of the Function]</td>
<td>![Supports fulfillment of the Function]</td>
</tr>
<tr>
<td>150</td>
<td>Set methods/metrics</td>
<td>![Supports fulfillment of the Function]</td>
<td>![Supports fulfillment of the Function]</td>
</tr>
<tr>
<td>152</td>
<td>Analyze data</td>
<td>![Supports fulfillment of the Function]</td>
<td>![Supports fulfillment of the Function]</td>
</tr>
<tr>
<td>153</td>
<td>Synthesize data</td>
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<tr>
<td>System Elements</td>
<td>Toolkit</td>
<td>Eco-Survey</td>
<td></td>
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<tr>
<td>-----------------</td>
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<tr>
<td><strong>Features</strong></td>
<td>01 02 03 01 02 03 04</td>
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<tr>
<td>42 Collect data</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>43 Process data</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>44 Determine condition</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>45 Categorize artifacts</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>52 Compare data with viewpoint</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>91 Gather data</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>93 Record data</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>95 Organize data</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>98 Measure variables</td>
<td>✔</td>
<td>✔</td>
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</tr>
<tr>
<td>99 Count specimens</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>102 Define interpretation method</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>151 Collect data</td>
<td>✔</td>
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<tr>
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<td>✔</td>
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<td>153 Synthesize data</td>
<td>✔</td>
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<td>✔</td>
</tr>
<tr>
<td>154 Interpret findings</td>
<td>✔</td>
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- ✔ Strongly supports fulfillment of the Function
- □ Supports fulfillment of the Function

Natural System Institute
<table>
<thead>
<tr>
<th></th>
<th>System Element Relationships</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>Formal Expert Discussions</td>
</tr>
<tr>
<td></td>
<td>Formal Expert Discussions may be held at the NSI HQ</td>
</tr>
<tr>
<td>2</td>
<td>Informal Discussions</td>
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<tr>
<td></td>
<td>Informal Discussions may be held at the NSI HQ</td>
</tr>
<tr>
<td></td>
<td>Informal Discussions and the Toolkit are both used to facilitate knowledge sharing</td>
</tr>
<tr>
<td>3</td>
<td>Research Knowledge Net</td>
</tr>
<tr>
<td></td>
<td>The Research Knowledge Net is the knowledge database for the NSI HQ and all of its regional offices.</td>
</tr>
<tr>
<td></td>
<td>Research Knowledge Net contains information about and links to the Toolkit</td>
</tr>
<tr>
<td></td>
<td>Research Roundtable determines the projects that will eventually feed information into the Research Knowledge Net</td>
</tr>
<tr>
<td>4</td>
<td>Eco-Survey</td>
</tr>
<tr>
<td></td>
<td>Eco-Survey findings may be displayed at the NSI HQ</td>
</tr>
<tr>
<td></td>
<td>Toolkit may inform many of the techniques used in Eco-Survey</td>
</tr>
<tr>
<td></td>
<td>1. Research Roundtable determines who works on Eco-Survey and what kind of research it will conduct</td>
</tr>
<tr>
<td></td>
<td>2. Eco-Survey reports to Research Roundtable</td>
</tr>
<tr>
<td></td>
<td>Alliance Network aids the Eco-Survey effort so as to cover a broad range of ecosystems</td>
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</table>

**Scoring**
- 3 Critical Relationship
- 2 Strong Relationship
- 1 Slight Relationship
- 0 No Relationship
<table>
<thead>
<tr>
<th>System Element Relationships</th>
<th>Natural Systems Institute</th>
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<tbody>
<tr>
<td>System Elements Pairing #9 - #12 with #13 - #16</td>
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<table>
<thead>
<tr>
<th>9</th>
<th>Publications</th>
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<tbody>
<tr>
<td></td>
<td>Donors mildly influence overall NSI Strategy</td>
</tr>
<tr>
<td></td>
<td>Donors will be used by the Policy Desk to influence the public and policy makers</td>
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<table>
<thead>
<tr>
<th>10</th>
<th>Donor Relations</th>
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<tbody>
<tr>
<td></td>
<td>Strategy Roundtable determines what kinds of Environmental Action Initiatives are most important and timely</td>
</tr>
<tr>
<td></td>
<td>The Event Planning Office will plan awards ceremonies and events for Scouts/Explorers/Corps/Generations</td>
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<table>
<thead>
<tr>
<th>11</th>
<th>Environmental Action Initiative</th>
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<tbody>
<tr>
<td></td>
<td>Strategy Roundtable may determine what types of lessons are taught to participants in the NSI Leader Programs</td>
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<table>
<thead>
<tr>
<th>12</th>
<th>Leader Programs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Some of the Leader Education includes policy-related material</td>
</tr>
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<table>
<thead>
<tr>
<th>13</th>
<th>Policy Desk</th>
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<table>
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<tr>
<th>14</th>
<th>Strategy Roundtable</th>
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<table>
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<tr>
<th>15</th>
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<tbody>
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</table>

<table>
<thead>
<tr>
<th>16</th>
<th>Face of NSI</th>
</tr>
</thead>
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<tr>
<td></td>
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</tr>
</tbody>
</table>

Scoring
3 Critical Relationship
2 Strong Relationship
1 Slight Relationship
0 No Relationship
### Description

A group of programs specifically targeted at empowering communities to participate in research and projects that improve the health of the earth.

### Properties

- cluster of educational initiatives for the community
- a commitment to outreach

### Features

- provides members in the community with resources to pursue their interests in environmental work
- empowers the public to get involved with environmental action
The Environmental Action Initiative is a strategic program in the Office of Outreach and Education, aimed at putting the power to change the world in the hands of communities and young people. It includes several different sub-initiatives that provide opportunities for various members of a community. These include a Scholarship Program for undergraduate students, Micro Grants for community members to conduct their own ecological research, Starter Kits that make it easy for communities to improve the health of their local surroundings, and a Distributed Volunteer Research initiative.

The Scholarship Program is funded by the Office of Donor Relations and provides full tuition for two juniors or seniors within the NSI region who are studying any one of the following disciplines: Earth Science, Plant Science, Environmental Science, Earth Systems, Ecology, or Evolutionary Biology. These students may apply online for the highly competitive scholarship and must demonstrate a long-standing commitment to bettering the state of the environment. The Scholarship provides full tuition for an academic year, and students cannot reapply. However, upon being NSI Scholars, they have access to NSI people and resources.

Micro Grants are small sums of money awarded to individuals or groups who are interested in conducting ecological research on a local level, with the stipulation that the NSI will share the rights to the results of the research with the grantee(s). Grant money will be provided by the NSI donors and will cover budgets of up to $30,000 per year. Applications and proposals must be submitted via the NSI website. Micro Grants are appropriate for short-term research projects that require limited resources. Only new research projects will be accepted; continuing applications will not be accepted.

Starter Kits are packages of materials and information that the NSI provides communities in order to get them started on improving their environment. For example, the NSI might give away free compost Starter Kits that provide compost bins, earthworms, and instructions on how to maintain the compost pile and reap its benefits.

Distributed Volunteer Research is a way to get important research done with the help of a large number of volunteers. NSI and affiliated scientists may never have enough manpower to collect samples from every beach on the Pacific Coast of the United States, but they can increase their sample collection by enlisting the help of interested volunteers and distributing the research tasks among these volunteers. This research effort intends to use the power of numbers to broaden the scope of the scientific process and enable the NSI to gather as much data as needed. As a result, the NSI will be able to have a much more detailed understanding of the environments it monitors.

SCENARIO

Candace Brooks first learned about the Natural Systems Institute in a speech given by renowned architect and environmental thinker William McDonough. On the NSI website, she found that there were many opportunities to get her students involved in environmental service. Besides teaching a section on current sustainability issues and basic ecology, Candace also challenges her students each year to design and propose a simple...
research or restoration project for the Micro Grant competition. Last year, her students won for the first time, and received a $5000 grant to study the effects of pollution on - and actively clean up - the River Avon system. With the grant money, the school was able to buy a new set of science tool and laboratory instruments, as well as waders for the students, not only for the river system study, but also for the other science labs in the school. Candace also attended an awards event at the NSI regional office in London with a few of her top students, and traveled to Beijing for the NSI International Film Festival last year.

Candace has spread the word about NSI to the rest of the teachers and administrators in her school system. Recently, one of the alumni from the local high school was awarded a Scholarship from the NSI to study Plant Sciences as a fourth year student at Oxford University. Candace was particularly proud, even though she was never this student’s teacher, because she recalled the day when the student came to her classroom at the end of the school day to ask her about the NSI Environmental Action Initiatives.

Outside of her role as teacher, Candace and her husband have actively participated in Distributed Volunteer Research for the NSI. For their region, this has primarily entailed collecting water samples from the river, labeling them, and sending them to the Swiss NSI office every month. All of the materials are provided by the NSI each cycle and include detailed background information about the project and instructions on when to collect, from where, and how to look for the best samples.

Someone else in her community learned about the Starter Kits that the NSI distributes and obtained a set of the “Compost Kit” for her neighborhood. An avid gardener for many years, Candace was delighted to discover that keeping a compost bin was so easy and rewarding; her vegetables have never been healthier, tastier, or more abundant! Some other neighbors in her community choose to get the “Solar Kit” in order to install solar panels on their roofs and save money on their energy bills. Candace and her husband are very interested in acquiring this Starter Kit as well—if only they had the time!
# NSI Leaders Program

## Description

The NSI Leaders Program is a curriculum for preparing people to become leaders of the NSI Family Adventures, NSI Scouts, NSI Explorers, NSI Corps, and NSI Generations. Offering courses in leadership training, wilderness maintenance, first aid, team-building, counseling and teacher-training, the NSI Leaders Program provides Leaders with the in-depth knowledge and skills that they will need to not only lead NSI programs, but also pass on the knowledge.

## Properties

- training program for leaders of NSI Corps, NSI Scouts, and NSI Generations
- collection of volunteers and full-time NSI employees
- traveling training program, classes held at local educational institutions
- led by a core group of NSI employees in Office of Outreach and Education (Programs Desk)
- collection of courses that may be required to lead NSI outreach groups

## Features

- prepares volunteers and NSI employees to lead groups of kids and adults in a number of outdoor activities, including camping and hiking
- teaches team-building
- teaches wilderness first aid along with methods for teaching safety

## Sources

- Henderson, Scott. Interview by Joyce

## Related Elements

- Environmental Action Initiative
- Event Planning Office
- Community Liaisons

## Contributors

Team members
Discussion

A major goal of the NSI is to educate the public and get them involved with sustaining their natural surroundings through hands-on experience and appreciation. In order to do this, the NSI must maintain a talented and skilled core group of program Leaders that continually educate interested volunteers and past program participants, as well as scientists who will be guest teachers/leaders, to lead new groups of participants into the field. These Leaders will need to grasp a basic understanding of the ecology of the region, master wilderness safety skills, develop counseling skills, and be able to inspire and empower people of all ages to become leaders.

The NSI Leaders Program will have a permanent staff within the Office of Outreach and Education’s Program Desk that is charged with the tasks of recruiting candidates, writing application forms, reviewing applicants, and teaching the courses. It is unique from other outdoor leadership and science training programs in that tuition is covered entirely by the NSI’s endowment; to avoid an overflow of students, the Program Desk limits the size of the candidate pool via a rigorous application process. Graduates of the program receive a Certificate and may subsequently reapply to be a program Leader as often as they want without retaking courses, so long as they skip no more than one; Wilderness First Aid must be taken every two years regardless of activity. These Certificates may also be used to pass out of certain courses at other institutions teaching offering similar curricula.

NSI Family Adventures are a series of 1- to 2-week long trips to various exotic locations around the world where either the local community leaders have done an exceptional job at creating environmentally sustainable communities and infrastructure, or there is a rare species of plant or animal, or habitat, whose survival is endangered. Families, including children as young as 5 years old, participate in various service activities and explore local culture and recreation. Leaders will develop programming for specific age groups in order to engage all levels of intellectual capacity; adults will have the opportunity to hear lectures and conduct experiments with experts in the field, and children will discover the joy of understanding how ecosystems work through hands-on projects.

NSI Scouts are the youngest age groups of children who participate in an outdoor leadership and science program that teaches them the basics of ecology, how climate works, how pollution affects the environment, and how to recreationally appreciate natural environments. The Scouts range in age from 8 to 14, with age groups separated by 2 year intervals. They conduct community service tasks and simple science experiments in the field while performing a variety of fun outdoor activities, such as fishing, boating, hiking, and camping.

NSI Explorers is the teenaged version of NSI Scouts, with ages ranging from 14 to 18. Corps members get involved more deeply with the science behind ecological processes, design their own community service projects, as well as experience more challenging outdoor recreation, such as snow-camping, snowshoeing, and multi-day backpacking trips.

NSI Corps is a service-oriented program that connects adults of all ages with environmental service opportunities across the globe. Interested individuals can find a database of international opportunities and apply on
Discussion

the NSI Corps website by specifying the areas of work they are interested in—areas such as trail maintenance, ecosystem restoration, urban planning, environmental education, activism, sustainable farming, appropriate technologies, etc.—and the countries they would prefer. The Programs Desk has a dedicated staff that utilizes a powerful database to review applicants and match them up with available opportunities. International governments work closely with local NSI offices and participating organizations to determine the financial, education, and professional benefits that each Corps volunteer will obtain. NSI Corps members serve for 1-2 years at a time.

NSI Generations is a localized adult ecology and environmental service program. Welcoming adults of all ages, these groups of 10-12 people meet weekly to perform various activities, including trail maintenance, beach clean-ups, species analysis and collection, pollution testing, etc.

SCENARIO

Jennifer was fifteen when her mother enrolled her in the local chapter of the NSI Explorers, where she and a group of ten other teenagers met twice a month for one year to perform a variety of activities, including backpacking trips, trail restoration, snow camping, community service at local zoos, canoeing and fishing trips, with various scientific studies of water, soil, flora and fauna along the way. She learned to see the natural world through new eyes and became keenly aware of how so many everyday activities destroy little pieces of the environment. At school, she started an environmental action group at her high school called Jersey Shores, which actively participated in cleaning up and protecting the beach ecologies along the New Jersey coast from contamination and erosion.

Now that she is eighteen and a high school graduate, Jennifer is eager to postpone her enrollment in college for one year in order to give back to the community. She will start a 9-month internship in the New York office of the Natural Resources Defense Council and is currently training to become an NSI Leader for an NSI Scouts group. For the next month, she will meet with other aspiring Leaders and take intensive courses in Wilderness First Aid, Leadership Theory and Group Dynamics, Team-building, Plant and Animal Ecology, Ecosystems, Research Methods, In-field Teaching Methods, and History and Ecology of the Adirondacks. The curriculum includes three overnight trips to different preserves and parks in New York, including a four-day backpacking trip in the Adirondacks.

At the end of the course, she will receive a Certificate as well as a Leader Course Pack for the NSI Scouts, which provides recommended activities and projects, safety reminders, cheat sheets, local resources, maps, etc. Other fellow leaders may receive similar course packs for leading NSI Corps and NSI Generations.