

Internationally coordinated practical projects

# ALPS 2011

Active Learning Project Sequence



Graduate School of System Design and Management  
Keio University



Delft University of Technology  
Prof. Gerard P.J. Dijkema

## Call for ALPS 2011 Projects under Theme of “Symbiosis and Synergy”

Are there any engineering, social, organizational or business problems that you wish to address? Something difficult that you can't take up in your normal, day-to-day activities? A medium or long-term task you need to accomplish? Would you be interested in working with our graduate students to find solutions?

The Graduate School of System Design and Management at Keio University (“Keio SDM”) is looking for projects related to the concept of “symbiosis and synergy”.

### ALPS (Active Learning Project Sequence)

“ALPS” projects provide recommendations on the design of innovative products, services and other systems using system design and management approaches developed in collaboration among Keio University, Massachusetts Institute of Technology (MIT), Stanford University in the USA, and Delft University of Technology (TU Delft) in the Netherlands.

We examine products and services related to a project, define the problems, learn the requirements of the interested parties, set system requirements, design concepts, propose architecture, repeatedly test and prototype, and then verify our recommendations. ALPS participants gain real-life experience in the design of totally new business models and innovative systems.



Massachusetts Institute of Technology Prof. Olivier L. de Weck

### How ALPS works

Graduate students at the Keio SDM form small teams (five or six members) and spend about six months working on the selected projects. Teams come from a variety of industries, jobs, areas of expertise, and generations. They work synergistically to incorporate the perspectives and requirements of a broad range of stakeholders and account for the entire lifecycle of the system.

Faculty from MIT, Stanford, TU Delft, Keio SDM make five two-day visits to the campus, (total of 10 days) to guide the projects. Teams perform detailed analyses of projects and provide you with reports that define products and services and the development process to achieve them. Their goal is to provide an innovative solution that will affect society at large.

ALPS received financial support from the Norinchukin Bank and the “Center for Education and Research of Symbiotic, Safe and Secure System Design,” a Global COE Program under the supervision of the Ministry of Education, Culture, Sports, Science, and Technology.

### Proposers

The Keio SDM refers to the individuals and organizations suggesting projects as “proposers.” ALPS proposers can be from private companies, government institutions, NPOs, research institutes, or other organizations.

In 2011, ALPS projects will focus on the aspects of “Symbiosis and Synergy system design”.

ALPS 2011’s theme is Symbiosis and Synergy. Students of ALPS will use the latest design thinking and systems engineering approaches to propose novel concepts for symbiosis and synergy. In systems engineering, symbiosis and synergy can mean a construct of different elements working together to produce results not obtainable by any individual elements. The elements can include products, services, people, facilities

and policies required to produce system-level results. The value created by the system as a whole, beyond individual and independent contributions, is primarily from the relationship and interaction among the elements (Blanchard, B., 2004)

Keio SDM invites you to propose a theme that can encompass and leverage symbiotic and synergetic relationships relevant to your organization.

### Symbiosis and Synergy

The term Symbiosis comes from the in Greek, *syn* “with” and *biōsis* “living,” describing an interaction between two different organisms living in close physical association, especially to the advantage of both (Oxford Dictionary). In particular, we refer to Mutualistic Symbiosis, a

relationship between individuals of different species where both benefit from each other (Ahmadjian, V., Paracer, S., 2000). The term Synergy comes from Greek word *syn-ergos*, meaning ‘working together’ (Segal-Horn, S., 2004).

### 2011 ALPS schedule and venues

ALPS will be conducted on the Hiyoshi Campus of Keio University for a period of approximately six months from May to the end of November 2011.

May 7	Deadline for companies/organizations to submit proposed projects
May 7	Kick-off meeting for proposer companies/organizations and Keio SDM (Project pitches and team organization)
May 13-14	ALPS Workshop 1 (Proposer company representatives give presentations about topics to ALPS students. Between workshop 1 and 2, Keio will do survey to students who will answer preferences of proposed projects, and form ALPS student groups and assign topics to groups.)
June 24-25	ALPS Workshop 2 (Lectures and student activities)
August 6-7	ALPS Workshop 3 and Interim Presentations (Lectures and student midterm presentations. We encourage proposer company representative to attend Workshop 3 in order to listen to student midterm presentations.)
September 30-October 1	ALPS Workshop 4 (Lectures and student activities)
November 18-19	ALPS Workshop 5 and Final Presentations (Lectures, student final presentations, and student elevator pitches We strongly encourage proposer company representative to attend Workshop 5 in order to listen to student final presentations.)

### Themes and projects in the past

#### 2008 theme: “Enhancing Senior Life”

##### Examples of projects

“Personal Mobility Services,” “Pet-Type Travel Navigation Robots,” “Senior Safety Jackets,” “Senior Life-Long Learning Programs” and “Second Life Simulation Games”

#### 2009 theme: “Sustainable Community”

##### Examples of projects

“Use of Empty Urban Schools for State-of-the-Art Water Cultivation Facilities, and Implications for Agricultural Education and Restaurants,” “Falling Birthrates and Implications for Food and Health,” “Personal and Family Communication,” “Soccer Communities,” “Sake Promotion” and “Maintenance of Craftsman Communities”



## Project Characteristics and 2011 Theme

Here is a list of sample topics we feel might provide a good entry to ALPS 2011.

### 1 Symbiotic Mutualism of Clownfish and Sea Anemone



Figure 1 : Symbiotic Mutualism of Clownfish and Sea Anemone (from <http://en.wikipedia.org/wiki/Symbiosis>)

There is a symbiotic mutualism of clownfish and sea anemone as shown in Figure 1. The sea anemone provides protection to the clownfish, as the predators of the clownfish prefer to steer clear of the poisonous tentacles of the sea anemone. After the sea anemone has eaten its meal, the clownfish feeds on the remains of the

kill. In return, the clownfish attracts other fishes with its bright colors into the tentacles of the sea anemone. This relationship shows, how living things have evolved relationships, with the help of which, they have ensured their survival.

### 2 Egyptian Plover and Crocodile



A classic example of symbiosis in nature is the relationship between the Egyptian Plover and the crocodile shown in Figure 2. The plovers will peck and feed on the food lodged between the crocodile's teeth while providing dentistry work.

Figure 2: Symbiosis of the Egyptian Plover and the crocodile

### 3 Use of Company's Byproducts and Waste Energy to Produce Valuable Material and Energy

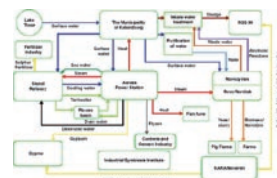


Figure 3 : Industrial Symbiosis of Kalundborg Industrial Park (<http://www.symbiosis.dk/>).

A notable example of both symbiosis and synergy in industry is the Danish industrial park of Kalundborg. Here one company's byproducts and waste energy becomes valuable material and energy for another. Various entities such as a large power plant, an oil refinery, a pharmaceutical plant, a plasterboard factory, an enzyme manufacturer, a waste company and the city itself forms an industrial eco-system as shown in Figure 3.

The above topics are merely suggestions made to illustrate the range of topics that fall under the ALPS 2011 umbrella.

Keio SDM is intending to arrange occasions to discuss with private companies in wide variety of industries, government institutions, or other organizations in order to find more project topic alternatives for ALPS 2011.

### 4 Merger of Airline Companies to Obtain Synergy Effect by Combining Non-overlapping Routes and Sharing a Hub Airport



Figure 4 : Merger of United and Continental Airlines to generate synergy effect by combining non-overlapping routes and sharing a hub airport.

Merger of United Airlines and Continental Airlines as shown in Figure 4 will produce synergetic effect by combining routes that barely overlap and by sharing a hub Houston Airport.

### 5 Use of Electric Power for Home and Plug-In Electronic Vehicles



Figure 5 : Use of Electric Power for Home and Plug-In Electronic Vehicles

Many future homes will be using solar power such as solar cells to supply energy for home appliances. At the same time, many homes are expected to own plug-in electronic vehicles. If homes use solar power for both home appliances and plug-in electronic vehicles, they will not

have to charge the vehicle batteries at public charge stations. This will reduce the burden of building a huge charge station infrastructure. Thus, if car companies and home power utility companies work together, great synergy effect will be obtained.

### 6 Artificial Photosynthesis for Symbiosis of Human and Nature



Figure 6 : Artificial Photosynthesis for Symbiosis of Human and Nature

Currently humans produce much more CO<sub>2</sub> than the limit which the Earth is able to endure. If the artificial photosynthesis technology is achieved as shown in Figure 6, both human and nature will be able to absorb CO<sub>2</sub> from the atmosphere, thus balancing with the CO<sub>2</sub> exhaust's by human activities of manufacturing, transportation, etc. This will result in a better symbiosis of human and nature.

## 2010 theme: "Safety and Security"

### Examples of projects

"Portable multi energy backpack system for refrigerating vaccines" (proposer company: Kokusai Kogyo group Infrastructure Innovation Institute, Inc.), "Building New Brand Image of Safety and Security Using Positive Cycle Business Model" (proposer company: Adidas), "Safe and Secure Solar Power Generation in Japan - dual Mode Solar Panel System: Proof of Concept" (proposer company: Delft University of Technology), "Safety Premium Point System" (proposer company: Suzuki Motor Corporation) and "Design of Bicycle Simulator to Reduce the Risks of Traffic Accidents" (proposer company: Toshiba System Technology).



## Call for projects

### Benefits to proposer companies

**BENEFIT 01** You are able to experience the system design techniques that have been developed and refined by the participating universities.

**BENEFIT 03** At the conclusion of the project, you receive a final presentation and final report from the project team full of creative, innovative ideas.

**BENEFIT 02** You have opportunities to work closely with the faculty at Keio University and the graduate students at the Keio SDM who represent the leaders of the next generation.

**BENEFIT 04** You can continue to conduct joint research with the Keio SDM after the conclusion of ALPS, using the ideas and intellectual properties created in the project as a base from which to develop new businesses. (Please consult with us about your ideas and requirements.)

### Supporter Program

Proposer companies can nominate members of their staff as project “supporters.” During the term of the project, supporters communicate with students and provide them with the information they require to conduct their research. They also facilitate collaboration on the project among different units within the company etc., and are invited to participate

in ALPS Workshops on the Hiyoshi Campus. Direct involvement in a project is extremely beneficial to supporters themselves and helps to improve the quality of the final report. (Proposer companies etc. are asked to bear the costs of any transportation and lodging expenses etc. incurred by their supporters.)

### ALPS 2011 Proposal Requirements

“ALPS 2011” will focus on “Symbiosis and Synergy System Design”. Under this theme, we are looking for problems and issues that are suitable to the ALPS approach to analysis and research and that are difficult to address in the course of ordinary business. Students will consult with faculty members to select which of the proposed projects to pursue.

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Submission deadline: May 7, 2011

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Fill in the required information on the attached submission form and return it by e-mail.

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Contact Professors Haruyama and Toma at SDM (E-mail: [alps@sdm.keio.ac.jp](mailto:alps@sdm.keio.ac.jp)) to inquire further about ALPS 2011 and to submit your “ALPS 2011 Project Proposal” (prescribed form).

**Graduate School of System Design and Management, Keio University** ▶ <http://www.sdm.keio.ac.jp/>

#### A graduate school with a one-of-a-kind concept

The Keio SDM examines three kinds of systems: product systems (automobiles, robots, mechatronic devices, biotechnology etc.), operations systems (space development and energy fields, including risk management and safety management) and social systems (marketing, supply chain, crisis management, disaster countermeasure, human relations etc.). “System design and management” attempts to visualize the sophisticated, complex issues inherent in these systems and arrive at solutions that incorporate a variety of perspectives. We believe that it is necessary to have a proper balance between detailed analysis that “sees the trees through the forest” and overall conceptualization that “sees the forest through the trees.” The Keio SDM is the first of its kind in the world, a completely new concept that creates a “melting pot” of people from different industries, jobs, and areas of expertise in both the sciences and humanities, and attempts to achieve a true fusion of the two.

#### Creative systems designers and innovative project leaders

The Keio SDM trains people who will be world-class leaders, capable of articulating new, important concepts. Creative system designers are able to grasp, understand the uses of, and design large technology systems with an enormous number of parts and innovative technology systems that provide new functionality. Innovative project leaders manage complex, large-scale projects with numerous interested parties and recommend innovative social systems to address environmental and social issues that have high levels of uncertainty and flux. Both groups combine detailed analytical skills and overall conceptualization skills to create new systems for any number of fields in today’s increasingly complex society.



4-1-1 Hiyoshi, Kohoku-ku, Yokohama, Kanagawa 223-8526  
Collaboration Complex, Keio University  
Tel: 045-564-2518 Fax: 045-562-3502  
E-mail: [alps@sdm.keio.ac.jp](mailto:alps@sdm.keio.ac.jp)  
Contact Professors Haruyama and Toma



# ALPS 2011 プロジェクト提案書

**E-mail : [alps@sdm.keio.ac.jp](mailto:alps@sdm.keio.ac.jp)**

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