論 文

“Leadership Engine” of Academics for Biomethane Energy Projects in Asia

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要　約

開発途上国において国際チームがエネルギープロジェクトを実施する際、しばしば言語、文化、資金、政治、技術等様々な障壁に逢着する。プロジェクトのために新しく結成される組織が、産学官からなるメンバーで構成される場合、目的や役割に対する認識の乖離により実行が益々複雑になる。

本研究は近隣諸国への技術移転と、大学に所属する研究者（大学人）により発明・開発された技術の実用化を目指し、日本及びアジア諸国の役人、大学人、企業人により実施されたバイオメタン・エネルギー・システムのパイロットプロジェクトに着目している。これらのプロジェクトを対象とし、大学のラボ実験や中央・地方政府との協力による計画の段階からプロジェクトの完結まで、プロジェクトに参加した全ての階層の様々なリーダーとフォロワーの観察を間近で行った。各々のケースについて、“Eight Steps to Transforming Your Organization”と呼ばれる Kotter のモデルをベースに分析した。プロジェクトを円滑に実施するためには、各組織のあらゆる階層のリーダーシップが重要であり、多層に存在するリーダーシップは未来のプロジェクトのための大学人“Leadership Engine”を作り出す事が示された。大学人による“Leadership Engine”がプロジェクトチームを、大学人による発明や開発技術やノウハウの実り多き実用化達成へと導く事が期待される。

ABSTRACT

When international teams carry out energy projects in developing countries, they often face many obstacles such as language, culture, finance, political and technological issues. If a newly formed organization for a project consists of members from industry, university and government, its implementation will be more complex due to the difference of their recognition of objectives and roles.

This study focuses on some biomethane energy pilot projects conducted by Japanese and Asian officials, academics and commercial enterprises/private companies with the aim of technology transfer and practical realization of invented or developed technologies by Japanese academics in neighbor countries. For those projects, from the stage of research at a laboratory and

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planning in collaboration with central and/or local government to the end, every possible leader of every level participating in the projects and others who followed the projects were monitored closely. The steps of each case were examined based on Kotter's model entitled "Eight Steps to Transforming Your Organization". The result shows leadership at every level in each organization for one project can create "Leadership Engine" of academics for future projects. "Leadership Engine" of academics leads project teams to achievement to deploy fruitful realization of invented or developed technologies or built up know-how by academics into practical success.

キーワード：リーダーシップエンジン、大学人、バイオメタンエネルギー、プロジェクト、実用化

Keywords: leadership engine; academics; biomethane energy; project; practical success

1. Introduction

Success of technology transfer and practical realization of commercial deployment abroad depends on human factor rather than technological development due to many obstacles such as language and culture barriers. A way to success is usually very long. Adams (1990) pointed out a lag of roughly 20 years between the appearance of research in the academic community and its effect on productivity in the form of knowledge absorbed by an industry. After researches at laboratories and surveys are completed, pilot projects for future implementation are often launched in developing countries by Japanese academics and industry to accelerate commercialization. Government usually supports such pilot projects. When a team for a pilot project consists of members from more than one organization, its implementation will be complex due to the difference of their recognition of objectives and roles. In addition, each organization has its leader but more than one leader from different organizations has to work together for one project. Such leaders from different organizations are not authorized to work for his/her project as an only leader even though one of their names is written as a "project leader" in a document. When a key technology was invented or developed by an academic, he/she is often chosen as a project leader of a pilot project with industry for practical realization of commercial deployment. But such a chosen academic for a pilot project cannot act as an only leader unlike a president of a private company. An academic leader does not have the power of personnel assignment and budget allocation for his/her pilot project. And yet he/she has an obligation to lead his/her project to success with other organizations even if he/she does not have such power.

Meanwhile, various leadership theories such as Trait Theory and Leadership Development Theory have been discussed in the world. But almost all of these theories are based on the assumption that a leader belongs to a specific organization and is authorized to work for a specific operation or a project as a leader with his/her staff to contribute to his/

her organization. When a project leader is not authorized to work for his/her project as an only leader but responsible for the project, its implementation will be much harder and authentic leadership must be required to unite people.

Turner (2005) said the 1980s was a period of intense research into project success factor, with many authors producing lists of project success factors. Morris identified success factors and failure factors with various factors identified at successive stages of the project management life cycle (Turner 2005). He mentions poor leadership as a failure factor during formation, built-up and close-out, but not in execution.

Tichy (1997) pointed out winning companies have developed into organizations with "Leadership Engines (Tichy 1997)", where leaders exist at all levels and leaders actively develop the next generation of leaders. The importance of leadership at every level of a company to win has been emphasized by other researchers as well. But leadership role of academics in pilot projects with industry and government to win technology transfer and practical realization of commercial deployment has not been discussed.

Both leadership and management are important for success of any projects/business, however, leaders are different from managers as Zaleznik (1992) said. There are many management problems and one of them is such that an academic leader does not have the power of personnel assignment and budget allocation for his/her pilot project. A project leader has to achieve his/her goal despite any management problems.

To identify leadership role of academics in pilot projects, this paper focuses on biomethane energy projects carried out by Japanese academics and other organizations with the aim to transfer technology and realize commercial deployment in Asia. Kotter's model (1995, 1999) entitled "Eight Steps to Transforming Your Organization" was applied to such projects as used for the other cases (Takeuchi 2016). The data obtained were analyzed by his model. If each member of a project team keeps his/her current system of each organization that he/she is working for, a newly formed organization for a project cannot be functional. And furthermore, some of the project members may create a short-term win and step forward to carry out another project. If they succeed in one project and step forward, they may work under the command of another newly formed organization again. As Eight Step Change Model is used to analyze the process when people want to change their current system, organization and so on, progress toward commercialization can be analyzed by the same model.

The objective of this research is to identify leadership role by academics and to reveal whether "Leadership Engine" of academics is crucial to transfer technologies and deploy fruitful realization of invented or developed technologies or built up know-how by academics into practical success.

2. Methods

Two cases which include pilot projects carried out by academics, commercial enterprises/private companies and government in Asia were selected and compared in this paper. Every possible leader of every level participating in the following projects and the others who followed the projects were monitored closely by taking part in these projects as a member and interviewing the other members. The data obtained during the projects were analyzed

by Kotter's model entitled "Eight Steps to Transforming Your Organization". This model was originally created to transform a commercial enterprise/private company for success in their project/business but it can be applicable to a project team that consists of members from various organizations because such members have to work together under the command of a newly formed organization during the project period.

3. Results

The followings are the description of each case. There are more than one stage/project in each case.

Case 1: Projects in India

Some academics of a Japanese university (henceforth, University N) hoped to conserve environment and support the poorest villagers in India. Villagers cut down trees and burnt them in traditional cooking stoves. Since some women and their children were suffering from asthma, biogas production from cow dung was welcomed. The Indian government funded people and there were several millions of small biogas plants installed all over India. But most of the plants were not working. From time to time, such funds were taken off by someone. The biogas plants were badly made with less budget and biogas leaked from the defective plants. Some academics of an Indian university (henceforth, University I) agreed to the concept of the Japanese academics. A local NGO in India also joined them. The Japanese academics gathered money to manufacture small biogas plants (See Figure1) in 2009 and the Indian academics installed them in one of the poorest villages in Madhya Pradesh in 2010.

Their project was welcomed by the leader of the village and many villagers. An Indian minister for rural development also agreed to their concept and activity and told the ministry of new and renewable energy (henceforth, Ministry N) to support their project. The minister for rural development and the director of Ministry N had a meeting with those academics to develop their project on the 18th of October, 2011. The objectives of the developed project were to introduce environmentally-benign technologies to rural areas and to encourage villagers to increase their income by new business. The academics of University N and University I drew a plan to establish a biomethane energy system (efficient biogas production, biogas collection while cleaning/upgrading it on a truck and storing biomethane by adsorbent under 1MPa, selling biomethane for automobiles and generating electricity at a biomethane station). Some Japanese private companies were ready to join the project and discussed the design of the biomethane energy system with University N. Ministry N changed the directors and University I started to work with the new director of Ministry N. Both universities applied for a fund supported by two Japanese agencies and their proposal was selected in 2012.

Figure 1 Small biogas plant in the village

There was a conflict between those two agencies. Their point of view about practical realization of technologies invented/developed by academics to contribute to society was completely different. One agency was willing to support the project since they hoped University N to develop their new technologies during the project period but the other agency tried to cancel the project from the beginning even just after the project was selected. They told University N not to conduct most of the proposed researches and activities.

As for the budget to carry out the project, one Japanese agency was to fund University N and the other agency was to provide only equipment to the Indian side. The budget in Japan was controlled by those two agencies, not by University N. University I needed to get another fund to hire Indian researchers and engineers from Ministry N. Such conditions and rules for the project had been explained to the leader of University I by the leader of University N before the project was selected in Japan and the leader of University I had agreed to all. But when an important meeting with University N, the Japanese agencies and Ministry N was held at University I, a retired academic whom Japanese academics had never met before and some old academics of University I appeared suddenly and insisted emotionally that University I should be funded by the Japanese agency to buy and install equipment in India.

The negotiation broke down. The Japanese academics warned the leader of University I that their project would be canceled if they could not agree all the conditions and submit some documents to the Japanese agencies in time. To make matters worse, the new director of Ministry N in India did not support the project. He seldom attended the meetings with the academics of University N and University I and the academics could not discuss any details with him. He did not prepare any important letters and documents to be submitted to the Japanese agencies. Finally the project manager of University N met his boss, the Joint Secretary of his

ministry to explain the critical situation and asked for his support. The Joint Secretary visited University N with the director three months later to declare financial support and signed the formal letter at University N. This letter was submitted to the Japanese agencies by University N but it was ignored. All the academics both in Japan and India thought the implementation of their project would be too difficult due to the weak coalition. Their project was canceled in September of 2013. The Japanese academics realized that leadership at every level in each organization for the project was crucial.

Here are the analyses of the progress after the proposal for the pilot project was selected by two Japanese agencies in 2012 by Kotter's model.

Step1: Establishing a Sense of Urgency

The Japanese academics identified the obstacles and discussed the crisis of their project with the Japanese agency that was willing to support the project. But the Japanese academics could not discuss crises with the other agency due to lack of mutual trust.

Step2: Forming a Powerful Guiding Coalition

Though the leader of University N was the leader of the project written in the proposal, he was not authorized to act as an only leader for the project. Therefore, he could not choose members from different organizations nor change members to make the guiding coalition powerful in a critical situation.

The Japanese academics could not encourage all the members to work together on the same vision as one team because there was a conflict between two Japanese agencies and some academics of University I did not like to understand the rules for funding the project.

Step3: Creating a Vision

The leader of University N created a vision and tried to share the vision with all the members to introduce environmentally-benign technologies such as biomethane energy system to rural areas and to encourage villagers to increase their income by new business.

Step4: Communicating the Vision

The leader of University N could not communicate the new vision and strategies due to the weak coalition both in India and Japan. Any opportunities and vehicles to communicate the created vision and strategies were spoiled by some members who acted on their own desires.

Step5: Empowering Others to Act on the Vision

The leader of University N could not get rid of obstacles to change. Though he was the leader of the project written in the proposal, he was not authorized to act as an only leader for the project. He could not choose members from different organizations nor change members even when the project was disturbed and spoiled on purpose by some members from different organizations. To make matters worse, the budget implementation system was complicated and its management including budget allocation was controlled by the Japanese agencies. To get rid of obstacles and to empower members to act on the created vision for success, a leader needs to have the power of personnel assignment, budget allocation and so on. Since the leader of University N did not have such power, leadership at every level in each organization was all the more crucial

to lead others to act on the same vision. Unfortunately, leadership at every level in each organization did not exist.

Step6: Planning for and Creating Short-Term Wins

The Japanese academics could not plan for visible performance improvements and create those improvements. Their project was disturbed and spoiled at the early stage of the project.

Step7: Consolidating Improvements and Producing Still More Change

The leader of University N could not reinvigorate the process with a new project and a theme due to the weak coalition.

Step8: Institutionalizing New Approaches

The leader of University N could not articulate the connections between the new behaviors and project success due to the weak coalition.

The result of the analyses above shows it was very hard for the academic leader to form a powerful guiding coalition. In consequence, he could not communicate his created vision with his members and could not step forward any more. In addition, he could not empower his members to act on the created vision since he was not authorized to act as an only leader for his pilot project and he did not have the power of personnel assignment and budget allocation.

Case 2: Projects in Thailand

The former governor of NakhonNayok Province (henceforth, the Province) of Thailand hoped to create a smart country that can serve its citizens for their happiness. (He became the Permanent Secretary of the Ministry of Information and Communication Technology later to establish smart system.) The Province is located in 110 km northeast of Bangkok with a population of 250,000 and Khao Yai National Park. He decided to introduce environmentally-benign technologies to the Province to conserve its great nature. The Province was chosen as the first smart city in Thailand by the Thai government. The Province hoped to get technological support from Japan and introduce Japanese fine technologies in the Province. A smart energy system to conserve the environment was suggested by Japanese academics in 2012 and it was accepted as the project of "Biomethane Energy System to realize the Smart City Concept in NakhonNayok Province, Thailand (METI 2013))" in 2013. It was not long before the important meeting was held in the Province on the 10th of July. 2013. The prime minister and some ministers of Thailand visited the Province to recognize the smart city then. The prime minister expressed at the meeting that smart technologies for waste disposal and wastewater treatment would be necessary for the smart city. The Province was interested in producing biogas by using food waste and utilizing cleaned biogas (biomethane) for poor villagers. They intended to educate their citizens to separate garbage and leave the work of selling biomethane to a village cooperative association. One dumping site was chosen as the place for installation of the biogas plant and they hoped to construct a recycle center and an incinerator next to the biogas plant. They drew up the blueprint and decided to spend four million baht to provide the prefabricated house for the biogas plant (see Figure 2) and a 2t commercial car that would be converted as an ANG (Adsorbed Natural Gas) car to collect food waste. They had a plan to utilize liquid fertilizer produced

from the biogas plant in the organic garden (see Figure 3). They were willing to promote the biomethane system with the Japanese government not only in Thailand but also in the ASEAN. Thailand was ready to become a leader of ASEAN Economic Community (henceforth, AEC) and the project team was invited with the governor to a big event of AEC organized by Channel 3 in Bangkok. Discussion with the advisor to the former prime minister (He used to be the minister of energy/the vice prime minister.) was done to promote the biomethane energy system. The Ministry of Energy, Thailand and a university of Thailand (henceforth, University S) also joined the project. The whole plan for the project including the promotion of the biomethane system was drawn by Japanese academics of a Japanese university (henceforth, University N) and the proposal of "Biomethane Energy System to realize the Smart City Concept in NakhonNayok Province, Thailand" was submitted to the Ministry of Economy, Trade and Industry of Japan (henceforth, METI). It was selected to be supported by METI in the end of July, 2013.

A small Japanese private company (henceforth, Company S) made a contract with METI and Company S manufactured the biogas plant (See Figure2) and installed it in the Province according to the instruction by University N. It was a promising but a risky project, for Company S had to borrow money for the project. METI could not reimburse the money to Company S until all the works written in the contract were completed in time. Three months later, a big demonstration against Thaksin Shinawatra and the Thai government started. Company S was on the verge of nonfulfillment of the contract and bankruptcy all the time during the project period between September of 2013 and March of 2014.

A big demonstration against Thaksin Shinawatra and the Thai government started just before the project team shipped their biogas plant from Japan. A lot of bombs were set in congested areas of Bangkok and many people were killed by the explosions of those bombs. The budget implementation by the Province was canceled and University S offered to budget the project. The place for installation was changed from the public dumping site to University S.

Despite the big demonstration against Thaksin Shinawatra and the Thai government, the Japanese academics could ship, install and start to operate the biogas plant in time.

But during the operation period, a researcher of University N reported to the leader of University N that Thai researchers had embezzled Japanese budget. After the investigation, his report was proved to be a lie. When he was asked why he had told such a lie, he screamed and insisted he had not reported anything to the leader of University N.

There was another problem just after all the experiments were completed in the beginning of March, 2014. Company S chose and installed a transformer whose capacity was too small. The wires burnt and the biogas plant was shut down suddenly but they blamed Thai engineers for the fire. Even after the investigation of the accident, Company S did not apologize to the leader of University S nor change the transformer. The leader of University N apologized to the leader of University S and offered to buy a big transformer but the leader of University S bought a new transformer on his own budget and did not blame any Japanese members.

The academics of University N and University S developed not only technologies

but also other leaders to complete all the experiments and get necessary data in time.

University S continued to operate the biogas plant for three years so that both universities could share the outcome and educated young researchers and engineers. In addition, University S installed other systems near the biogas plant and conducted more researches in various fields with another university in Thailand to establish an environmental training center.

The Japanese academics are still trying to introduce their know-how and technologies to other countries in collaboration with some ministries including METI and commercial enterprises/private companies.

Figure 2 Biogas plant installed in NakhonNayok Province.

Figure 3 Spray liquid fertilizer from the biogas plant in the organic garden.

Here are the analyses of the progress after the project was selected by METI in 2013 by Kotter's model.

Step1: Establishing a Sense of Urgency

The leader of University N identified and discussed the crises of the financial situation of Company S and the political situation in Thailand with all the organizations.

On the other hand, there was a big market of ASEAN and many good opportunities for promoting the established energy system were expected.

Step2: Forming a Powerful Guiding Coalition

The leader of University N could form a powerful guiding coalition with METI and all the organizations in Thailand to work together as one team on the same vision but could not form a powerful guiding coalition with Company S and one researcher of University N. There was no leadership in Company S and it made a guiding coalition weaker at the site.

Leadership by academics was required to complete the project. When a coalition was not powerful enough, leadership at every level in each organization was all the more required. Leaders of University N and University S had to think about how to build leadership at every level in each organization. Both leaders tried to build and develop leadership at every level in each organization.

Step3: Creating a Vision

The leader of University N and the leader in NakhonNayok Province (the Governor) created a vision to establish an ideal smart energy system and to educate engineers for the first smart city in Thailand.

Step4: Communicating the Vision

The leader of University N and the leader in NakhonNayok Province (the Governor) could use every opportunity and vehicle possible to communicate the new vision and strategies in Thailand but could not communicate the vision well in Japan due to some Japanese members described above. Despite language and culture barriers, the leader of University N could communicate the created vision with all the members in Thailand. A person with a negative feeling such as a sense of inferiority makes a coalition weak anywhere in the world. Leadership at every level in each organization for the project at this stage was crucial to overcome difficulties and achieve the goal. The project leader of University N encouraged the other leaders from the other organizations of Japan and Thailand to build every possible leader at every level in each organization.

Step5: Empowering Others to Act on the Vision

The leader of University N got rid of obstacles to change and encouraged risk taking and nontraditional ideas, activities, and actions thanks to the leadership at every level in each organization of Thailand. Despite the big demonstration against Thaksin Shinawatra and the Thai government, the Japanese academics could ship, install and start to operate the biogas plant in time.

Step6: Planning for and Creating Short-Term Wins

In collaboration with METI and all the Thai members, University N could plan for visible performance improvements and create those improvements. METI explained how to manage their fund to the Japanese academics but never controlled anything. The academics of University N and University S developed not only technologies but also other leaders

to complete all the experiments and get necessary data in time. Success was achieved by young educated researchers during the project supported by METI.

Step7: Consolidating Improvements and Producing Still More Change

After the project supported by METI was finished, the leader of University N fired or changed some Japanese members for future projects and could reinvigorate the process with new projects in collaboration with other private companies to deploy fruitful realization of invented or developed technologies or built up know-how by them into practical success.

Step8: Institutionalizing New Approaches

The leaders of both universities are still developing the means to ensure leadership development and succession. The Japanese academics are trying to introduce their know-how and technologies to other countries in collaboration with some ministries including METI and commercial enterprises/private companies. Leadership at every level in each organization for one project created "Leadership Engine" of academics for future projects.

The result of the analyses above shows it was hard to form a powerful guiding coalition, however, the project leader of University N encouraged the other leaders from the other organizations of Japan and Thailand to build every possible leader at every level in each organization. When a coalition was not powerful enough, leadership at every level in each organization was all the more required. Both academic leaders tried to build and develop leadership at every level in each organization.

Despite the big demonstration against Thaksin Shinawatra and the Thai government, the academics could get rid of obstacles to change, completed all the works and created a short-term win during the project period supported by METI.

The project leader could reinvigorate the process with new projects in collaboration with other private companies to deploy fruitful realization of invented or developed technologies or built up know-how by them into practical success. Both academic leaders are still developing the means to ensure leadership development and succession.

4. Discussions

Here we discuss leadership role by academics in pilot projects and whether "Leadership Engine" of academics is crucial to transfer technologies and deploy fruitful realization of invented or developed technologies or built up know-how by academics into practical success.

From the analyses of two cases above, "Forming a Powerful Guiding Coalition (Step 2)" is the hardest amongst eight steps for an international team that consists of members from industry, university and government. For the domestic cases of Japan analyzed in the previous work (Takeuchi 2016), to form a powerful guiding coalition is found to be the most difficult step to clear as well.

An academic leader is not authorized to act as an only leader for a pilot project with industry and government. Therefore, he/she cannot choose members from different organizations nor change members to make the guiding coalition powerful in a critical situation.

And furthermore, each laboratory of a university in Japan is independent.

Academics tend to work independently as they like. Generally speaking, academics are not good at uniting the hearts of people to make them act on the same vision. In fact, to unite people from various organizations and make a powerful guiding coalition must be very difficult even to a leader of the military. What happened to multinational forces in the past? How did they overcome difficulties? What happened to the European Union? How will they overcome various obstacles from now on? To unite people from various organizations and form a powerful guiding coalition is the hardest subject to be tackled in the world.

A weak coalition spoils a mission/a project and its team cannot go forward from one step to another step smoothly. And a weak coalition disturbs any changes to deploy realization of invented technologies or built up know-how by academics into commercial success. When a key technology was invented by an academic, he/she must have a strong desire for fruition of his/her seed of idea and know his/her technology the best amongst all the members from various organizations. The ideal is to have leadership by the academic who knows his/her technology fully and clear eight steps in his/her pilot project. Unfortunately academics have very few experiences to unite people.

When we compare Cass1 with Case2, the biggest difference is the existence of leadership at every level in each organization. Since leadership at every level in each organization did not exist, the academics could not make a coalition powerful to overcome difficulties in Case1. On the other hand, the academics tried to build and develop leadership at every level in each organization so that they could get rid of obstacles to change and created a short-term win in Case2.

Not only to form a powerful guiding coalition but also to overcome various difficulties, leadership at every level in each organization is crucial. When a formed coalition is not powerful enough, leadership at every level in each organization leads project members to act on the same vision. It is to be desired that an academic who is a project leader should encourage the other leaders from various organizations to build every possible leader at every level in each organization. And furthermore, leadership at every level in each organization for one project created "Leadership Engine" of academics for future projects in Case2. The newly formed organization for the pilot project has developed into the organization with "Leadership Engine" of academics, where leaders exist at all levels. The academic leaders have been developing the next generation of leaders for sustained success as educationist of technologies and leadership. Not only winning companies but also winning projects carried out by academics in collaboration with other organizations shall create "Leadership Engine" of academics for achievement to deploy fruitful realization of invented or developed technologies or built up know-how by academics into practical success.

5. Conclusions

In this study, two selected cases on biomethane energy projects conducted by two countries were analyzed using Kotter's Eight Step Change Model. The followings are pointed out.

"Forming a Powerful Guiding Coalition (Step 2)" is the hardest step amongst eight steps of Kotter's model for an international team that consists of members from industry,

university and government. A weak coalition spoils a pilot project and its team cannot go forward from one step to another step smoothly. And a weak coalition disturbs any changes for practical realization of invented or developed technologies by academics. When a formed coalition is not powerful enough, leadership at every level in each organization leads project members to act on the same vision. Leadership role by an academic who is a project leader is to encourage the other leaders from various organizations to build every possible leader at every level in each organization.

Leadership at every level in each organization for one project can create "Leadership Engine" of academics for future projects. Not only winning companies but also winning projects carried out by academics in collaboration with other organizations have "Leadership Engine" to achieve the goal. Thus "Leadership Engine" of academics is crucial to transfer technologies and deploy fruitful realization of invented or developed technologies or built up know-how by academics into practical success.

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