Influencing Factors and Processes Involved in the Commercialization of the Industry-University-Government Alliance Outcomes

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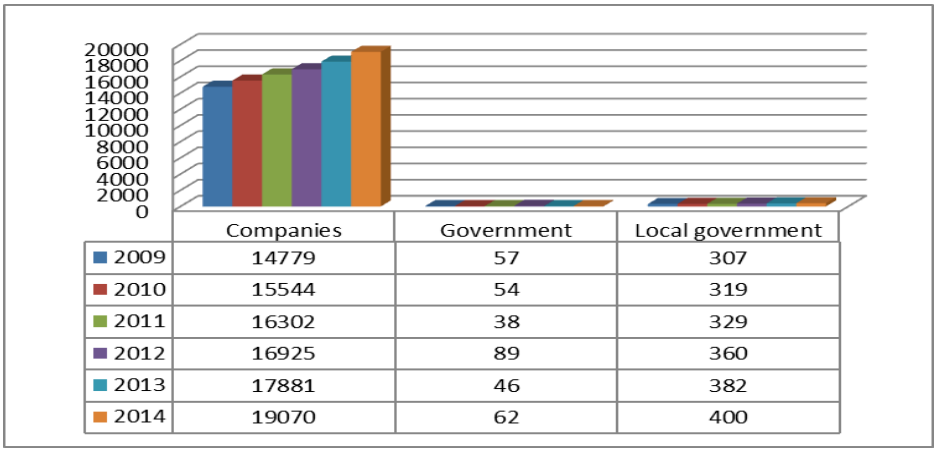
Abstract
According to data from the Japan Science and Technology Agency (2009 to 2014), total numbers of Industry-University-Government Alliances (IUGA, hereafter) more than doubled. However, from the industry side, there are few analyses about influencing factors and processes involved in the commercialization of IUGA outcomes. Thus, an understanding of factors and organizational cooperation processes (internal & external) which stimulate commercialized outcomes from IUGA is needed.
From this background, the current study identifies the factors influencing the coordination of technology systems among companies aiming for mass production then, identifying organizational processes among companies which commercialized. For identifying factors and processes, case study the data was compiled for the Toshiba Corporation in Japan, which participated in IUGA for reducing greenhouse gases in Yokohama city (April 2010 to March 2015).
From the analysis, this research found that the project leader who has both technological knowledge and an understanding of the overall process is able to manage the outcomes of the project. Furthermore, adopting the standard interface (Open ADR2.0b) for CEMS and BEMS can enable companies to establish mass production with improved coordination. Additionally, local government leadership was identified as being significant in encouraging commercialization.

Keywords: Industry-University-Government Alliances, leadership of local government, management factors, technological factors.

1. Introduction

In recent years, the number of companies participating in the total numbers of Industry-University-Government Alliances (IUGA) has substantially increased (figure1). Previous research looked only at the factors and reasons involved in the IUGA process which was separated into 3 stages prior to commercialization: the initial structure establishment period, the technology and system establishment period and the commercialization period. It should be noted that the technology and system establishment was further divided into research about economic efficiency, safety, and the combination of technology on the one hand and research about the safety and stability system for mass production on the others.

Figure 1. Alliance partners with university between other entities



	Companies	Government	Local government
2009	14779	57	307
2010	15544	54	319
2011	16302	38	329
2012	16925	89	360
2013	17881	46	382
2014	19070	62	400

(source)
https://sangakukan.jp/top/databook_contents/2015/cover/2015-2016_databook_ALL.pdf

The research within the first 2 stages of the IUGA process looked at management factors and also the technological factors affecting coordination among entities. However, this level of research was not applied to the safety and stability systems for mass production within the second technological and system establishment stage. Nor, was it applied to the final stage of commercialization.

From this background this paper identifies factors influencing the coordination of among companies within the safety and stability systems for mass production within the second technological and system establishment stage and the final stage of commercialization.

2. Previous Literature

2.1 Initial structure establishment period: Management side factors influencing coordination of entities

In the beginning of IUGA, participation entities had to consider the governance structure in each period for IUGA. It summed up the IUGA needs several stages and coordinative considerations of the R&D, assessment and investment system to commercialization (Fujikawa, 2011; Koh, 2015). In addition to this they decided to

formation of promotion councils for the management of entities. In this process local governments helped the participation entities with the subsidies (Koh, 2015).

2.2 Initial structure establishment period: Technological side factors influencing system coordination

With the promotion council in place, the coordination of participation entities from the technology system commenced (Koh, 2015). The formation of this coordination varied due to differences in the technology. At the beginning of this period, local government entities met with companies to better understand these differences though this process was marked by trial and error (Koh, 2015).

2.3 Technology and system establishment period: Management side factors influencing coordination entities

During this period, a practical awareness of error-free economic efficiency, that made use of technology realized (Ring & Van de Ven, 1992; Doz & Hamel, 1998; Morandi, 2013). The nature and purpose of entity participation in IUGA had an effect on the form system development and coordination among companies.

2.4 Technology and system establishment period: Technological side factors influencing system coordination

Coordination among companies was shaped by the level of technological relatedness. The more they were related, the greater was the hierarchical coordination both vertically and horizontally, between participating entities. Achieving efficiency development and mass production, a modular system was adopted by the participating entities. (Koh, 2015).

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3. Case Analysis

3.1 Research Method

For identifying factors influencing the coordination of among companies within second stages, this paper used the case analysis with semi-structured interviews to Toshiba Corporation (hereafter, Toshiba) and Yokohama city in Japan. The former had participated in IUGA as the project manager to develop smart grid system as an example and the later as a local government for supporting companies to progress IUGA.

In Yokohama city, named as the Next-Generation Energy and Social system project started in 2010 with the participators those who are the ministry of economy, trade and industry in Japan, universities, local government and companies. This is for the smart grid system development that is next generation type of power transmission and distribution network to reach stable supply of power, using IT technology.

Generally, the energy supplier provides electricity from the power plant through the Electric Grid and Telegraph Poles. However smart grid system is two way systems. The solar panels attached to homes and buildings accumulate electricity and store any excess in batteries. The connection between Central Energy Management System (hereafter, CEMS) and Home Energy Management System (hereafter, HEMS), Building Energy Management System (hereafter, BEMS) allows the energy supplier to draw electricity from these batteries during peak demand. Additionally, the end user is compensated financially for their electricity. The development of the smart grid system in Yokohama city had promoted from April 2010 to March 2015 and the two thirds of its budget covered by government subsidy and last of it covered by participating companies.

3.2 Case Analysis about factors influencing the coordination of among companies within the safety and stability systems period preparing for mass production

The IUGA (named Next-Generation Energy and Social system project) in Yokohama city separated with 4 working groups those are CEMS, HEMS, BEMS, EV (electric vehicle).Toshiba participated 3 projects excepting EV and have been the project manager. Figure 2 shows how many companies participated within each working group and the necessity of the coordination among companies.

Figure 2. The Steering committee and members of working groups within IUGA in Yokohama city

Steering Committee :General manager in Yokohama representatives of working groups and related firms				
Board of Governors				
Project Manager : Toshiba Corporation	CEMS Working Group Leader: Toshiba	HEMS Working Group Leader: Toshiba	BEMS Working Group Leader: Meidensha	EV Working Group Leader: Nissan
	• Accenture • Kasai Electric Power CO.INC. • Sharp Corporation • Sony Energy Device • Tokyo Electric Power CO.INC • Hitachi Ltd. • Meidensha Corporation • NEC Corporation	• Daikyo Astage Inc. • Tokyo Gas • Toshiba Corporation • Panasonic Corporation • Mitsui Fudosan Real estate company • JX Nippon Oil and Energy • NTT Docomo • NTT Facilities	• Shimizu Corporation Engineering Company • Sumitomo Electric Industries Companies • Taisei Corporation • Toshiba Corporation • JGC Corporation • Meidensha Corporation • NEC Corporation	• Orix Corporation • Orix Auto Corporation • Hitachi Ltd. • NEC Corporation

(source: From the interviews to Yokohama city and Toshiba)

Toshiba participated two projects within the each working groups(CEMS, HEMS, BEMS). For this reason Toshiba could share information within the company about customers and projects. Additionally, persons in charge of CEMS, involved in the same business unit in Toshiba, though they can understands how the other projects progressed during the safety and stability systems stage. However, the commercialization to use outcomes of the IUGA not just made with coordination of the knowledge inside companies. In addition to the coordination between the projects within company, considering about coordination among companies to utilize outcomes of the IUGA would be necessary. It means coordination ways among companies are necessary.

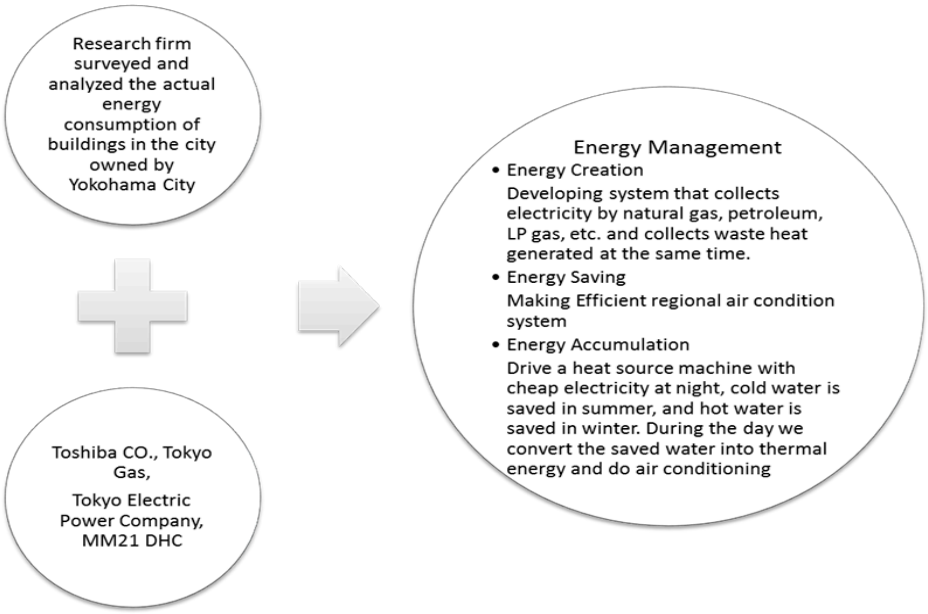
Participating companies developed system separately and combine them. For constructing smart grid system, there should be the way to coordinate them from the management and technology sides. Yokohama city and Toshiba as a project manager make the system to implement the regular meeting among working groups companies and within the working groups. As a local government, Yokohama city not only participated in constructing of the steering committee and its operation but also explain the intention of IUGA to citizen and handled complains from participating companies and citizen. The supporting of the local governments is one of factors that successfully shared information among companies. In addition to management side, technological factors also influenced coordination among companies.

The meeting within and among working groups make sense as the place that can sharing information but the purpose of participating to IUGA, the policy of each company to projects and the knowledge related system development are different. Though the technologically companies needed the way to coordinate them. For coordinate variety companies the interface standard called as Open ADR 2.0 is adopted as they developing a system. It is adopted in United States first as for the networks connecting standards. By adopting Open ADR 2.0, each company just focus on recognizing the connection part when combining with another system that developed other systems, and develop other part based on its own knowledge.

3.3 Case Analysis about factors influencing the coordination of among companies for the commercialization

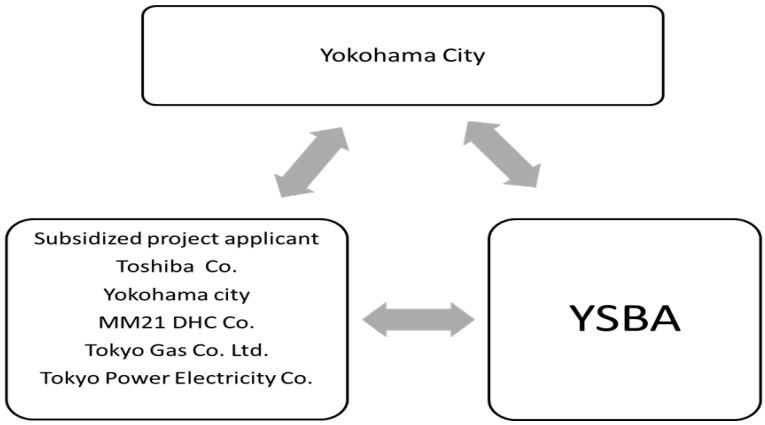
Yokohama city, Toshiba and other 14 companies organized Yokohama Smart Business Association (hereafter, YSBA) after IUGA finished on March, 2015 for commercialization of outcomes of the IUGA. YSBA started on April, 2015 under the formation of figure3 and the information flow of figure4. Figure3 explained formation and role of the executive committee for commercialization. Additionally, figure4 shows the information flows among Yokohama city, YSBA and other participating entities. Except Yokohama city, the motivation to participated in YSBA is the aggressive supporting attitude of the Yokohama city to commercialized the outcomes of the IUGA.

Figure 3. Formation and role of the executive committee for commercialization



(sources: http://www.city.yokohama.lg.jp/ondan/ysba/sanka.html)

Figure 4. The information flows among participators within YSBA



(source: http://www.city.yokohama.lg.jp/ondan/ysba/sanka.html)

As figure3 and 4 shows the leadership of the Yokohama city as the local government would be the one of factors to make participation to the other companies.

4. Conclusion and Contribution

The purpose of this paper is identifying factors influencing the coordination of among companies within the safety and stability systems for mass production within the second technological and system establishment stage and the final stage of commercialization. From the analysis, the local governments support from management side and standard interface from the technological side have the possibility to influence the coordination of among companies within the safety and stability systems for mass production. Furthermore, the aggressive attitude and leadership of the local government to utilize the outcomes of IUGA has the possibility to be the influencing factor of coordination among companies during commercialization stage.

Previous research analyzed the role of local government in the period of initial structure establishment and technology (Fujikawa, 20011; Koh, 2015) and system establishment for consideration of economic efficiency and combination of the technology (Ring and Van de Ven, 1992; Doz and Hamel, 1998; Morandi, 2013). However, those are the only limited to the first two stages. From this paper it found that the role of local government has the possibility to continue to the commercialization stage to make coordination companies. Furthermore, the local government supporting for providing experimental facility first, then providing information necessary for making the smart grid system to companies on the commercialization stage would be the one of the factors to progress commercialization.

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