Collective Strategy for Implementing Innovation in SMEs

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Abstract: Collective strategy, which allows small- and medium-sized enterprises (SMEs) to take on orders that a single company with its limited technical resources cannot, does not function in practice. However, Kyoto Shisaku Net (literally, “Kyoto Prototyping Network”) is a group of companies that uses collective strategy to aggressively take on projects that other companies turn down for reasons such as “the specifications aren’t finalized,” “there is no way to estimate the cost of this project,” and “common sense tells us that is an impossible request.” There are three reasons for the creation of this virtuous circle: 1) In the Kyoto Shisaku Net participation stage, member companies of the Net participate with the understanding that it is a place to practice the “five percent rule,” wherein companies devote five percent of their profit and time to new efforts, company growth, and opportunities for innovation. 2) In the prototyping stage, employees are motivated by participating in cutting-edge R&D, and the companies gain knowledge related to R&D. 3) After the prototyping stage, companies accumulate experience by taking on cutting-edge projects and can stop the vicious circle SMEs find themselves wherein they do not have the experience to win orders. In this
manner, Kyoto Shisaku Net has created a virtuous circle mechanism that functions as a collective strategy by aggressively working on cutting-edge prototypes.

Keywords: SMEs, collective strategy perspective, legitimizing resource mobilization, innovation

1. Introduction

Small- and medium-sized enterprises (SMEs) have fewer management resources compared with large companies. Thus, SMEs face severe resource constraints when attempting to expand their businesses, and struggle with their narrow range of operations. Collaborating to win orders is an effective collective strategy to solve this problem. Astley and Fombrun (1983) defined a collective strategy as “a systemic response by a set of organizations that collaborate in order to absorb the variation presented by the interorganizational environment.” In addition, Dollinger (1990) emphasized the fact that “collective strategy attempts to overcome strategic weakness through interorganizational and collective activity.” A common theme in discussions of collective strategy is the focus on collaboration, coexistence, and cooperation at the cooperative organization level (Yamakura, 1993).

However, it is not ordinarily easy to make such collaborative efforts function properly. This is because such an arrangement may raise the likelihood of unfair distribution, with respect to distribution of profits and outcomes, and changes in the distribution of outcomes (Perrow, 1992) as well as power dependencies (Emerson, 1962). In practice, power among members often comes into conflict and causes the system of collaboration to collapse. According to a study of collaboration in winning orders by the Japan Information Service
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Industry Association (1995),¹ 79% of respondents stated that “it was difficult to deal with troubles that arise,” and 60% stated that “it was difficult to set up methods for allocation of work and payments.”

In the meanwhile, there are examples of functioning collaboration systems for winning orders. Kyoto Shisaku Net (literally, “Kyoto Prototyping Network”), a group of SMEs in Kyoto that takes on prototyping projects, is one such example. Since its inception more than ten years ago, companies in the group have maintained their relationships, and have aggressively expanded their activities. Kyoto Shisaku Net as a collective strategy has had no dysfunctions or disturbances (Bresser & Harl, 1986).² Moreover, the Net dares to take on difficult and uncertain work that other companies refuse for such reasons as “the specifications on this project are not finalized,” “there is no way to estimate the cost of this project,” and “common sense tells us that is an impossible request” (from Kyoto Shisaku Net website) based on collaboration, coexistence, and cooperation among the multiple member companies. How can Kyoto Shisaku Net aggressively take on projects for which it is generally difficult to foresee how much time will be required? What mechanisms create this virtuous circle? These are the research questions examined in this study.

2. Case Study: Kyoto Shisaku Net

Kyoto Shisaku Net began in July 2001 primarily as a collaborative system to win orders for the production of prototypes and to exhibit products at trade shows. A characteristic of this case study is the

¹ While this study limits its scope to the information service industry, it is helpful as a reference in understanding the actual state of the collective order-taking operations.
² Accordingly, this study is positioned as a transfirm organization research (Takahashi, 2014).
aggressive effort to win orders despite projects specifications being unclear, impossible to quote, and full of complex and difficult demands. While prototyping involves trial and error until the product is completed, Kyoto Shisaku Net is seeking to create a business with strong elements of R&D.

2-1. Method

The author has followed the activities of the members of Kyoto Shisaku Net since 1998. Many qualitative studies have been conducted with semi-structured interviews (including group interviews). The qualitative research in this study was done from 1998 to September 2010, over six separate time periods. Interviews were conducted at 39 companies and organizations, totaling 63 hours and 25 minutes.\(^3\)

2-2. Summary of Kyoto Shisaku Net

Kyoto Shisaku Net comprises 18 SMEs (as of May 2011) located in the city of Kyoto, and is an organization that collaborates on winning prototyping orders. The system allows members to experiment with various projects among themselves that they cannot handle alone. Members share the costs, present proposals aggressively, and take efforts to win orders. The group positions itself as an organization that helps create an initial step toward making Kyoto an industrial cluster for the prototyping business. It also quickly seeks to provide solutions to customer needs. To take on orders for a broad range of prototypes, participating members have a strong awareness of member differentiation in technologies and fields.\(^4\) If all members

\(^3\) A particularly interesting point regarding the development of Kyoto Shisaku Net after September 2010 is that it has become a “gatekeeper” organization (Inamizu & Wakabayashi, 2013) that responds to demands outside industrial clusters using its intra-cluster network.

\(^4\) As emphasized by Wada, Ichikohji, and Ikuine (2014), one can view the members of the Net as accumulating specialized technologies to
had the same technologies, there is a high likelihood of cannibalization occurring among collaborative projects within the organization. Avoiding such a fate requires companies to take action beforehand. Even when companies have the same equipment, they may take on different roles by differentiating among themselves through focusing on specific fields, prototype sizes, machining methods, and other technologies, and using these differentiating factors to their advantage.

Kyoto Shisaku Net exhibits products at trade shows in a number of fields as part of an effort to promote its operations. It exhibit products not only at trade shows for machinery and precision equipment, but also at shows in such disparate areas as aerospace and railway technology, commercial designs and displays, interior design, restaurants, ready-to-eat foods, contract food services, and hospitality. Using these promotional activities to gain footholds, the Net takes on projects for a wide variety of prototypes. However, this endeavor involves many projects that are difficult to complete due to unclear product specifications, unquotable projects, and a high level of technological uncertainty. Members themselves say that they have little to gain from this business considering the time and costs involved.

2-3. Achievements of Kyoto Shisaku Net

Projects that Kyoto Shisaku Net has handled include a prototype for a mirror backbone for a solar power system used in space by the Japan Aerospace Exploration Agency (JAXA). JAXA asked the Net to build an adhesive-joined prototype that weighs 100 grams per square meter. This request was in line with the requirement in the aerospace

intentionally differentiate themselves to create a network within the Kyoto regional industrial cluster.

For details on prototyping projects or customer comments, refer to http://www.kyoto-shisaku.com/voice/01
industry for a mirror that also weighs no more than 100 grams per square meter. A JAXA official noted that “sensible” companies would turn down the agency’s quest saying that it would be impossible. Since the product must be light and strong at the same time, some unexpected things occurred. “At first we kept making things, and they would become warped or turn out quite differently than we had expected” (Shosaku Yamamoto, senior vice president and representative director of Yamamoto Seisakusho). The Net had repeated failures, but members conferred among themselves upon each failure, and continued to experiment, finally completing a prototype. The group delivered the completed prototype, and attended a meeting to report on the prototype. JAXA commended the group’s work.

Another example would be the development of miniature robots, a joint project between the industry and academia pursued with the participation of the Advanced Telecommunications Research Institute International (ATR) and others. This particular project called for robots that are user friendly and cost-effective. The Net proposed the use of materials that do not easily fracture when these robots fall frequently. The robot built in this project won the worldwide Robo Cup competition five times in a row from 2004 to 2008. 6 ATR officials praised the Net for providing advice and proposals.

The Net also created a prototype for an ICT system development project undertaken jointly with the Kyoto Institute of Technology to support the spirits of in-home elderly. The Net was involved in the project at an early research stage, when it was still unknown if the project would be technologically feasible. When this type of project begins, participating members do not automatically assume that it is impossible. They instead consider what they should do to make it

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6 For details, refer to http://www.vstone.co.jp/products/team_osaka/
work. If the project does appear to be out of reach, participants suggest alternative plans after considering how the product would be used. Even when customers do not have answers, the Net creates prototypes through trial and error. Customers, who frequently communicate with the Net through emails, often send messages expressing their satisfaction with the Net and its prototypes.

As seen above, Kyoto Shisaku Net uses trial and error to complete prototyping projects. It further makes aggressive proposals to its customers and spends considerable time and efforts interacting with them frequently to discuss matters in detail.

2-4. Activities of Kyoto Shisaku Net

Kyoto Shisaku Net presents its products at trade shows in a variety of areas in an effort to win orders. The Net has a unique way of displaying its products. It does not simply display processed parts and explain how they were processed. The group also creates products to be exhibited using individual members’ processing techniques that are not usually visible and are difficult to evaluate. In this way, their technology becomes visible. The Net submits products created in this fashion to contests. Some of the products displayed and entered into contests include an aluminum machining artwork in the shape of a jacket hanging on a hanger and a shoe with its lace untied. A model of an insect includes carefully detailed parts created with a mold material (CENA1) processing technique, and egg art was created with a 3D technique that can etch eggshells at depths of only 0–0.2 mm. A piece of interior artwork entitled “Kokuhan”7 is a photograph etched into a plate of 1-mm-thick aluminum with a carved aluminum relief of only a thousandth of a millimeter. These works have received multiple awards, such as at “The Cutting Dream

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7 “Kokuhan” is a registered symbol.
Contest Awards” sponsored by DMG Mori Seiki Co., Ltd., the “Precision Sheet Metal Technology Fair” sponsored by the Amada School, and the “Good Designing Award” sponsored by the Japan Institute of Design Promotion.

2-5. Effects of being member of Kyoto Shisaku Net

Some of the benefits that members participating in the Net feel they receive are, first, in the area of technology changes. Through tradeshows, prototyping, and other activities of Kyoto Shisaku Net, members have opportunities to acquire new technologies they have not worked on previously, as well as opportunities to expand into different industries using existing technologies. There are case studies of members developing new business through these opportunities. As an example of the former case, members that previously did not have 3D manufacturing technologies were able to work with these technologies through Net projects. Members that had worked on embedded control software had the opportunity to work on Android applications. As examples of the latter case, members that had worked on the 3D modeling business with laser-beam lithography technology in turn used that modeling technology to create simulations of body organs for medical use, which spurred the development of business in the medical field. Members that had worked on manufacturing processing used precision milling techniques to create works of art and expand into the interior design business.

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8 This contest, for companies, schools, and research institutions that use milling equipment in Japan, started in 2004. For more information, see http://www.dmgmoriseiki.co.jp/dreamcontest/summary/index.html

9 This fair began in 1989 as a way to improve sheet metal forming techniques and skills, and is sponsored by the vocational training Amada School, an educational arm of Amada Co., Ltd.

10 For more information on the Good Design Award, see http://www.g-mark.org/about/g21.html
A second benefit felt by Net members is the internal change that occurs within member companies. This is due to improvements in capabilities involving planning and execution, consultative proposals, and development. Kyoto Shisaku Net never dismisses a project simply because it is full of unreasonable demands. Although such a project may require significant amounts of time and effort, members consider what must be done to complete the project, proactively make proposals, suggest alternatives, and through trial and error create prototypes which customers themselves cannot imagine. These experiences lead to increased competence among members, who describe this process as where “business owners learn by the sweat of their brows.”

3. Discussion

The research questions discussed in this study are as follows: How can Kyoto Shisaku Net continue to aggressively take orders that other companies turn down on grounds that “the project’s specifications aren’t finalized,” “there is no way to estimate the cost of this project,” and “common sense tells us that is an impossible request” (from Kyoto Shisaku Net website)? What is the mechanism that creates this virtuous circle? In fact, participating members of the Net communicate frequently with customers and create prototypes through trial and error. They spend prodigious amounts of time and effort making “artworks” for display in exhibits. Members all say that “considering the costs and benefits, this business takes a lot of time and has few rewards.” Despite that, members actively participate in Kyoto Shisaku Net activities. Below, we summarize reasons for that participation, with a focus on three phases.

3-1. Participation phase

The first phase is participation. Members must have an
understanding of what technologies they need to expand the businesses of their company. They must also see the Net as a place to explore possibilities to use their technologies in a variety of industries. Members who have such an understanding also understand that Kyoto Shisaku Net is a place to practice the “five percent rule,” which provides opportunities for growth of the members through spending about five percent of profits and time on new projects. That is why members use the phrases “the unexpected often happens” and “unplanned learning.” The Net has a system of provisional membership when recruiting new members, to ensure that the purpose of membership is not diluted. This also serves to instill the purpose of participation in the Net among its members. In other words, unless all members feel that “Kyoto Shisaku Net is a place to get clues for innovation,” there is no meaning to participation in the Net. Via Net practices, members can expand the range of their technologies, expand the industries in which they work through leveraging their technologies, and develop the ability to propose suggestions based on flexible thought processes that would allow them to accept jobs that appear to be impossible to handle. Systematic learning (Kobayashi, 2014) is what enables individual learning.

It has been shown that even SMEs are aware of the importance of innovation and attempt to conduct R&D on their own, and that individual companies tend to be aware of their lack of capital and personnel to invest in R&D (Japan Small Business Research Institute, 2009). However, even when individual companies attempt to somehow resolve these issues and undertake R&D on their own, the

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11 The provisional membership system requires payment of a monthly membership fee of 20,000 yen, and a six-month training period. Training includes a Drucker (1954) reading circle to understand the importance of business innovation and customer creation, upon which trainees come to understand Kyoto Shisaku Net’s objectives, activities, and how it operates.
probability of success in technology-based push innovation, where there are no customers, is low.\textsuperscript{12} Further, innovation success or failure is only evident after observing how it turns out (Takeishi, Aoshima, & Karube, 2012). Thus, it can be difficult to tie R&D to “innovation.”\textsuperscript{13,14} These elements are impediments to advances in innovation among SMEs with particularly large constraints in business resources (Gassmann, 2006; Rahman & Ramos, 2012a).\textsuperscript{15} According to the Basic Survey of Small and Medium Enterprises conducted by the Small and Medium Enterprise Agency of Japan in 2011 (using 2012 data and 2011 corporate results), in actuality, the fewer employees a company has, the greater is the tendency to not conduct R&D. The members of Kyoto Shisaku Net are no exception. However, in the case of the Net, single companies overcome the issue of “few resources for legitimizing mobilization for innovation” (Takeishi, Aoshima, & Karube, 2012), and, with multiple companies banding together for differentiation, they can leverage their creativity and technologies into opportunities for new business as they take on prototyping projects with the minimum amount of capital required for innovation. In other words, activities of Kyoto Shisaku Net are a

\textsuperscript{12} Tidd, Bessant, and Pavitt (2001) emphasized that “there are limitations to single-sided management of either technology-based push innovation or needs-based pull innovation. Accordingly, innovation requires both a technology-based push and a needs-based pull, or in other words, interaction between the two.”

\textsuperscript{13} Following the definition used by the Hitotsubashi University Institute of Innovation Research (2001), innovation creates “economic achievements.”

\textsuperscript{14} For example, Gerstenfeld (1970) reported the results of a survey that showed the probability of success for commercialization of US government-related projects is no more than 32%. In addition, Intel’s Grove (1993) developed the argument that the achievements of R&D must move past the “valley of death” where it becomes difficult to move to commercialization. This speaks well to the difficulty in tying “innovation” to R&D.

\textsuperscript{15} Accordingly, some studies call for the creation of policies to promote innovation activities among SMEs (Asheim, 2004; Rahman & Ramos, 2012b).
“provision” (Mizuno, 2013b) for the members of the Net.

3-2. The prototyping process

The second phase occurs when an order is received and the prototyping begins. In this phase, employee awareness and capabilities are enhanced through cutting-edge R&D. The work done by the Net requires more effort than conventional prototyping activities based on specifications provided by customers. However, the company participating in the project can improve its development competency and the ability to make suggestions. Employees also experience a greater sense of achievement knowing that they successfully completed challenging projects dealing with subjects that are drawing so much public attention. Masahiko Takeda, the president of Cross Effect and the chairman of Kyoto Shisaku Net, commented in his conversations with customers from ATR this way:

From the perspective of member SMEs involved in manufacturing, the research material we work on, including the ATR robots, is cutting-edge, or perhaps even somewhat beyond cutting-edge. This really motivates employees, and just by our working with ATR our jobs are very interesting....When the products we create become public and are in magazines, catalogs, brochures, or newspaper, the motivation of our employees grows even more.16

Employees make similar comments.17

In addition, participating companies sometimes gain valuable information and future insights concerning R&D, as well as the state of the industry, through their frequent interactions with their clients during the prototyping process. For example, member companies can obtain a variety of information from their work: aerospace-related issues, material used to solve those issues, earthquake-proofing

16 See for more details http://www.kyoto-shisaku.com/voice/02/02.shtml
17 See for more details http://www.kyoto.shisaku.com/staff
structures used in high-rise buildings, robot and component development, quality requirements in the medical industry, or development work in a variety of fields. This information is important for members as they look for ways to leverage their existing technologies and develop promising new technologies.

3-3. Prototyping track record

The third phase occurs when prototyping projects are completed and members build a track record. This is a way to solve the problem that SMEs have when their lack of a track record means that they are not trusted and have no ability to win orders. In the prototyping business, members will take on work to gain the confidence of customers and follow-on work, even though the initial business may not be profitable. This has the benefit of generating positive reviews from current customers, which can lead to new customers. The ties built up through Kyoto Shisaku Net have turned into actual business, which has resulted in steady customers in some cases. The 50 (approximately) Net customers that existed at the group’s beginning have since expanded to 470 as of 2009.18

4. Conclusion

This paper examined why a collective strategy that does not normally function effectively has allowed Kyoto Shisaku Net to aggressively take on projects that other companies are reluctant to accept. These reasons were considered with respect to the following three phases: 1) In the Net participation phase, members must accept that Kyoto Shisaku Net is not a place to make a short-term profit and that they are to devote five percent of their time and profit for learning. 2) In the prototyping process, working on cutting-edge

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R&D increases employee capabilities and motivation, and also allows companies to gain information related to R&D. 3) Developing a track record of prototyping is a means to win orders and develop new customers. In other words, Kyoto Shisaku Net has created a system where members are aware of the need for participation, and feel the benefits of the group through the process of actual prototyping and the experiences they gain. This creates a virtuous circle, allowing the Net to aggressively win orders that other companies turn down for such reasons as “the project’s specifications are not finalized,” “there is no way to estimate the cost of this project,” and “common sense tells us that is an impossible request” (from Kyoto Shisaku Net website).

However, readers should note that this paper is an interpretation of a single case study, and is insufficient from the perspective of generalization.

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