Partner Selection for Open Innovation

Marina Z. Solesvik and Magnus Gulbrandsen

> *"An innovation, to be effective, has to be simple and it has to be focused. It should do only one thing, otherwise, it confuses. If it is not simple, it won't work. All effective innovations are breathtakingly simple."*
>
> Peter Drucker (1909–2005)
> Author and Management Consultant

In this article, we consider open innovation from the perspectives of: i) causation and effectuation, and ii) social networking. Our empirical evidence consists of a case study of a late-stage open-innovation project aimed at creating a hybrid ship that uses liquid natural gas and hydrogen as power sources. The results show that the effectuation approach is preferable to open innovation when the initiator of open innovation aims to keep sensitive information inside the closed group, when the initiator has established an effective team of representatives from other firms from earlier innovation projects, and when the participants are geographically close.

Introduction

Open innovation is a popular approach within innovation studies and innovation in practice. Open innovation is defined as "the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and extend the markets for external use of innovation, respectively" (Chesbrough et al., 2006; tinyurl.com/d5aaxah). A significant amount of research has been devoted to different aspects of innovation partnerships, such as the motives for, and the impacts of, collaboration. However, the important aspect of partner selection for open innovation has received limited attention from scholars (Li et al., 2008; tinyurl.com/csgdhvq). At the same time, selection of the right partner is probably the most crucial aspect of open-innovation success (Solesvik and Westhead, 2010; tinyurl.com/cujskmc). To better understand partner-selection issues, additional research is warranted to explore which mode of partner selection leads to a more effective open-innovation process.

Effectuation and causation approaches might be applied to explore partner selection for open innovation. Sarasvathy (2001; tinyurl.com/cmjpnxg) suggest that "causation processes take a particular effect as given and focus on selecting between means to create that effect. Effectuation processes take a set of means as given and focus on selecting between possible effects that can be created with that set of means." R&D cooperation is one of the forms of open innovation (Herzog, 2008; tinyurl.com/bs7dgco), and the bulk of it uses causation logic as a given. For example, a firm sets a goal to develop a new innovative product. If the firm's management subsequently decides that it is better to cooperate with others to achieve this goal, managers screen the environment for possible partners. The next step is normally to select one of them and to write a formal/contractual R&D agreement. This agreement will specify obligations in time, ownership, deadlines, milestones, and possibly other aspects. Cooperation either successfully continues or terminates after the goals are achieved.

However, observations of R&D partnerships show that some entrepreneurial firms follow an effectuation path that has a more ad-hoc and bottom-up character (Sarasvathy, 2008; tinyurl.com/c2zknnj). Entrepreneurial firms screen their networks of customers, suppliers, and other actors to find reliable partners (i.e., they ask the question: "Whom do we know?"), they are engaged in existing relationships, and they decide underway what several partners can do together.

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This article focuses on partner-selection issues for open innovation in the maritime sector of Norway. There are many public support programs in Norway that directly or indirectly build upon an open-innovation approach. Firms may receive tax credits for collaboration with universities and research institutes, they may receive direct support for joint R&D with other firms or public R&D units, and various public agencies organize and facilitate clusters and networks at regional and sectoral levels. Hence, firms are continually encouraged to enter into new partnerships and to strengthen and redefine existing ones. The research questions of this study are:

1. Do firms follow causation or effectuation logic when they form open innovation partnerships?

2. How do firms select partners for open innovation?

The study aims to make several contributions to the existing knowledge base. First, the article offers fresh insights to the literature on partner selection in open innovation. Second, the forming of R&D partnerships in open innovation will be considered through the lens of effectuation and causation theory, which is a novel approach to explore R&D alliance formation. The article is constructed as follows. First, we outline the dimensions of effectuation, causation, and social networking approaches. Then, we present the qualitative methodology that we have employed in the analysis. Next, we present the findings and derive propositions. A final section discusses future research that focuses on partner selection for open innovation.

Theoretical Background

Effectuation/causation theory and social networking theory make up the theoretical background of the issues we examine. Effectuation theory is named as one of the key entrepreneurship theories (Moroz and Hindle, 2011; tinyurl.com/c47h9yt). Originally, Sarasvathy (2008; tinyurl.com/c2zknnj) and other researchers used this theory to explain behaviour of entrepreneurs when they start and operate businesses. In this study, we attempt to go further and use the effectuation approach to explore the cooperative behaviour of entrepreneurial firms. But first, a presentation of Sarasvathy's (2008; tinyurl.com/c2zknnj) effectuation theory is required.

Effectuation theory has received much attention from entrepreneurship scholars in explaining the decision-making approach of some entrepreneurs (Fisher, 2012; tinyurl.com/c8yb7rd). Entrepreneurs using the effectuation approach do not have a clear goal when they start the venture. In the first phase of a new venture, an entrepreneur or a top management team asks three key questions: "Who are we?", "What do we know?", and "Whom do we know?". In the second phase, the entrepreneur/top management team asks "What can we do?" with the existing set of resources and networks and decides how much money it is possible to "sacrifice" in the development of the new business (i.e., they follow the "affordable loss" principle). The third phase is "stakeholder interaction", where customers, suppliers, and even competitors, are actively engaged in the new venture development. The fourth and final phase is "leveraging contingencies"; effectuators should be ready to accommodate new pleasant and unpleasant turns of destiny and be ready to transfer them into opportunities. If we observe partner-selection issues for R&D alliances through the lens of the effectuation theory, the top management team selects a partner in the first phase together with an audit of their own personal assets (i.e., skills, knowledge, and resources).

Oppositely, causators act according to a conventional logic known from the business training programs. First, the market is analyzed for prospective opportunities. The analysis is often based on market research and other scientific methods of analysis. After this, an entrepreneur or a top management team sets the goals. Then, the set of means to achieve these goals are determined. In case of a lack of own resources, an entrepreneurial firm might consider forming an R&D alliance and finding a partner who owns necessary resources or knowledge. Then, an entrepreneurial firm screens the market for potential partners. Finally, it selects one suitable partner to form an alliance.

Effectuation/causation theory has largely been developed and employed to analyze individual entrepreneurs or relatively small firms and their management teams. In this article, we apply the theory to a larger firm in a mature industry. We assume that such a firm will be involved in more partnerships and that these partnerships will have taken on an institutionalized character. This means that partner selection probably more often takes preexisting networks as a starting point, corresponding to an effectuation strategy, even though the firm may have the resources to pursue a more formal causation approach.

In general, some authors have distinguished between two modes of partner search: the institutionalized mode or mechanism and the social mechanism (Ran-

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gan, 2000; tinyurl.com/cljdet3). Social network theory adds to the insights from the effectuation theory in the exploration of R&D alliances formation within open innovation. Social capital is related to an ability to benefit from networks, social relationships, and structures (Cope et al., 2007; tinyurl.com/d9zerq4). Social capital originates at the individual level and the organizational level (Nahapiet and Ghoshal, 1998; tinyurl.com/dxarvo6). Davidsson and Honig (2003; tinyurl.com/dyg2u98) noted that "social capital can be a useful resource both by enhancing internal organizational trust through the bonding of actors, as well as by bridging external networks in order to provide resources".

Research Method: A Case Study Approach

This exploratory study was positioned within an interpretive research paradigm. A single case study method (Yin, 2003; tinyurl.com/7ywkcpy) is used to explore the research questions related to open-innovation partnership formation and partner-selection issues for open-innovation development. This technique enables the analyst to get deep insights into the mechanisms underlying the selection mechanism for open innovation. A qualitative case study method is appropriate because the aim of this study is to generate fresh and deeper insights into the process of partner selection related to an open innovation.

The case we selected involved the development of a unique and revolutionary ship that uses liquid natural gas and hydrogen power. It is the only ship of this type under development in Norway. We studied the process of partnership formation for this project and the firms that were involved in the open-innovation process.

In 2012, seven semi-structured interviews were carried out among the participants of an open-innovation project aimed at developing an environmentally friendly hybrid-platform supply ship for a Norwegian shipping company. The interviews subjects included the project managers responsible for the project in the partner firms (i.e., the classification society, the shipping company, the engine producer, and the shipyard). Research institutions were not involved in the project.

In order to triangulate information collected from face-to-face interviews, additional data sources were used (e.g., information from reports, company web pages, other Internet sources, and trade/technical magazines). By combining several modes of data collection, an in-depth description of the partner-selection process was obtained.

Case evidence was analyzed iteratively by clustering and organizing the data around key words drawn from the social networking, effectuation, and causation theory to discover patterns (Yin, 2003; tinyurl.com/7ywkcpy). An iterative analysis relating case analysis was conducted (Eisenhardt, 1989; tinyurl.com/7dfuc3z). This process enabled the detection and understanding of the effectuation, causation, and social-networking activities of collaborating firms to be highlighted, and allowed us to explore the alignment of case evidence with existing theory (Strauss and Corbin, 1990; tinyurl.com/cy7thrz). The data were compared with existing theory and then analyzed in relation to the four phases of the effectuation process. After the data were analyzed, propositions were developed to build theory.

Findings

The shipping company is rather innovation-oriented and the idea of a ship that uses fuel cells emerged from dialogues with the classification society, suppliers, and ship designers. The company had ties to these actors before this idea emerged. Earlier, the shipping company was the first in Norway to introduce an offshore vessel that uses liquid natural gas as its fuel. The Norwegian Government also stimulates green shipping and supports projects aimed to diminish carbon dioxide and nitrogen oxide emission and to develop environmentally friendly technologies. The case project – the development of a ship that will use fuel cells as an alternative power source together with liquid natural gas – was launched in 2003. The use of fuel cells permits a 30 per cent fuel savings, the emission of carbon dioxide is up to 50 per cent less compared to conventional fuel, and there is no emission of nitrogen oxides, sulfur oxides, or particles. Fuel cells use hydrogen, but hydrogen cannot be preserved on board the vessel. Thus, an R&D alliance developed a technology that makes it possible to extract hydrogen from liquid natural gas. Det Norske Veritas (DNV; dnv.com), which is a large and R&D intensive Norwegian company specialized in engineering services oriented at safety, quality, and the environment, is formally responsible for the project. The R&D work within the project started in 2004 and should be completed in 2014. Currently, in April 2013, the project is in its third phase, meaning that the vessel is ready, small models of the fuel-cell device have been tested, and the fuel-cell equipment soon will be installed on board the vessel.

The project used an open-innovation approach and united enterprises based in Norway and Germany. Initially, five companies created an R&D alliance and con-

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tributed 20 per cent each to the new alliance. They were the classification society Det Norske Veritas, two shipping companies (one Norwegian and one Swedish), a Norwegian ship design firm, and a Norwegian automation firm. Later, the Finland-based multinational Wärtsila (wartsila.com) acquired both the ship design and the ship automation firm and now owns a two-fifths share in the R&D alliance. Partners contributed with their core competencies to a new product development. The project was later financially supported by the Research Council of Norway (forskningsradet.no) through a FellowSHIP program and tax reduction schemes. The Government covered about 40% of the R&D expenses. As for partner-selection issues for this project, the parties knew each other before the project started. The project manager of the fuel cell ship at the shipping company who initiated the cooperation stated:

"We did not want to go to the market and announce a tender to develop parts of the project, i.e. ship design or elaboration of the engine. We worked with the partners whom we know over many years. And we are sure that the information will not leak. We know that we can cooperate effectively. We have compatible organizational cultures. And we are geographically close. We [the shipping company], ship designer, automation and engine developer and the shipyard are in the same district. So it is easy to organize meetings and travel will not take much time. The project leader, DNV, is in Oslo. But again, we all have cooperated with DNV for many years. DNV has established a contact with one of the best manufacturers of fuel cells in the world which is situated in Munich."

So, for an open-innovation project, the project initiator wishes to use only reliable partners with whom they cooperated earlier. This finding is in line with a previous study (Kock and Torkkeli, 2008; tinyurl.com/d4n3tsb), where the researchers found out that 65 per cent of open-innovation projects are carried out with "steady partners". So, at the initial stage of project development, the initiator group at the shipping company asked themselves the three questions from the first phase of the effectuation process: "Who are we?", "What do we know?", and "Whom do we know?". In Table 1, the citations from interviews related to the four phases of effectuation are presented. The shipping company had successful cooperation relationships with the ship design firm, a shipyard, and an automation firm, which developed the engine. They have had tight relationships with each other over 20 years and finalized an innovation project aimed at developing a vessel driven by liquid natural gas. The project was completed successfully. The shipping company became the first in Norway to introduce an environmentally friendly gas-driven platform-supply vessel in Norway. This discussion leads to the following propositions:

Proposition 1: *Firms that had mutually beneficial relationships with certain firms in past open-innovation projects would tend to engage the same partners in new open-innovation projects.*

Proposition 2: *Firms that prefer to keep sensitive information related to a product to be created in an open-innovation project, tend to select partners from those firms that they know from the past and have established trustful relationships, rather than select partners in the market.*

Participants in the joint venture for a hybrid ship development are active in serving the highly profitable Norwegian oil sector. Thus, they could afford to use a certain amount of their profits for the new product development (Phase 2). The R&D alliance has estimated how much money they can afford to invest in innovation development and managed to attract money from the national research council to sponsor 40 per cent of R&D costs. Initially, they had a rough idea of what the final vessel would look like, although the construction of the device that produces fuel cells has been changed over the project through close interaction among stakeholders (Phase 3).

The participants interacted not only with each other but also with other firms that did not own stakes in the R&D alliance but also were well known to participants (i.e., a shipyard). A number of contingencies occurred over the project development, and the partners managed to turn many of them into profitable solutions (Phase 4). First, the regulation framework for the use of fuel cells on board ships did not exist. All parties involved in the project contributed to the creation of the maritime rules that will regulate the development, construction, and exploitation of hybrid vessels using fuel cells. Second, the German company has a very wide experience in development and production of fuel-cell aggregates that are used on the ground, such as auxiliary power sources for hospitals. In the open sea, the weather conditions are severe and the fuel-cell machinery is in constant movement. This was one of the problems that practitioners solved in the project, and they have acquired a patent for this invention. Third, hydrogen cannot be preserved on board because it is highly explosive. The alliance has found a way of producing hydrogen on board the vessel. Next, the fuel-cell machinery, which produces electricity to drive the en-

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gine, warms up over the course of three hours and finishes the production of the fuel cells during 24 hours. In other words, the ship cannot stop when it needs to go to the port. The alliance developed special accumulators to collect the electricity that the fuel-cell aggregate produces. Again, this invention was also patented. The partners hope to sell licenses on products they have developed within this project (i.e., outbound innovation). They argue that the demand for environmentally friendly vessels will increase soon because international authorities constantly introduce new rules related to pollution and emission of carbon dioxide and other gases. This discussion leads to following proposition:

Proposition 3: *Initiators of open-innovation projects tend to use an effectuation approach to new R&D venture formation when they have only a rough idea about the final product.*

Conclusions and Implications

This article considered one of the central aspects of open-innovation formation, namely R&D alliances, and in particular the issue of partner selection for open innovation. The concept of effectuation was applied to answer the research questions of this study. The results show that effectuation rather than causation is a suitable approach for open-innovation development under certain circumstances. Innovations are related to sensitivity of information outflow, and initiators of innovation prefer to deal with known partners that they trust, rather than look for new partners in an open market. In this manner, firms may retain certain benefits such as limited secrecy and first-mover advantage even when working in an open-innovation mode. The effectuation/causation dichotomy has earlier been applied largely to entrepreneurs and small and young firms,

Table 1. The effectuation process over the open-innovation process in the shipping company

Phase	Question	Citation
1 Means-driven transformation	Who are we?	*"We are a shipping company that uses a proactive strategy to a new fleet development."* - Head of project in the shipping company
	What do we know?	*"We have developed a new technology that allows ships to use both liquid natural gas and traditional marine oil as a fuel. We have knowledge and competence in new product and revolutionary technology development."* - Head of project in the shipping company
	Whom we know?	*"We have established good relationships with a number of firms (i.e. suppliers, customers, banks, and authorities)."* - Head of project in the shipping company
2 Technology of foolishness	What can we do? (Affordable loss)	*"We freshly developed and implemented a new technology that allows to reduce emission from our ships. We have a good team of cooperation partners who created an innovative vessel. What can we do together further? May be we can try to make a Prius* [a hybrid from Toyota] *in the sea."* - Project engineer in the shipping company
3 Docility	Stakeholder interaction	*"We decided to create a joint venture where each party will have 20% stake. The participants were two shipping companies (one later went out), the classification society, automation firm, and ship design company. The Norwegian government also was attracted to participate and contributed with about 40% of R&D expenses support."* - Head of R&D department at the ship design firm
4 Leveraging contingencies	Making lemons into lemonade	*"Several challenging problems that were on the way to implementing ground-based hydrogen fuel cells technology in the sea occurred on the way, starting from the regulation obstacles together with a number of sophisticated technical tasks. Problems were solved. A number of patents were registered."* - Project manager at the automation firm

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where the actors generally are more resource constrained and may be forced into more open modes of innovation. Our case describes a mode of limited openness: partner selection is based on current trustful relationships, and each partner may be allowed to bring other trustworthy actors into the partnership. But, even when supported by public R&D funding, the network has a limited number of partners, and it has resulted in inventions that are possibly new to a global market.

The results of the study would be interesting to policymakers responsible for the promotion of open innovation and development of innovation systems in key economic sectors. The results will also be of interest to practitioners from firms interested in attracting external knowledge to promote innovation in their firms. The findings also might be useful to open-innovation scholars and academics involved in innovation-development processes together with businesses. Additional in-depth qualitative studies are warranted to explore the applicability of the presented propositions in other industrial and geographical contexts. Large-sample, representative, longitudinal, quantitative studies of firms involved in open innovation with contrasting types of partner selection are also warranted to test the presented propositions.

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