Taking innovations to market

The role of strategic choice and the evolution of dynamic capabilities

Lene Foss, Tatiana Iakovleva, Jill Kickul, Elin M. Oftedal and Anne Solheim

Abstract: How are innovations taken to market? Both theoretically and empirically, the process of commercialization has received scant attention. This study investigates the early commercialization process of three innovative firms in the Norwegian petroleum industry. The authors argue that the role of strategic choice is important for the processes these firms use to create and build their own dynamic capabilities. In this regard, they address the central question of what role the strategic choice of the firm plays in the process, creation and evolution of its dynamic capabilities during the early stage of commercialization. The authors’ findings reveal that certain dynamic capabilities are emphasized and appear to be more relevant to the strategic intentions of the CEO or entrepreneurial team. Two firms, whose strategic intent was to commercialize and exit, were more inclined to build an adaptive capability, while the firm intending to commercialize and to stay in the market stressed the importance of absorptive capability. Common to all three cases is the finding that adaptive and absorptive capabilities seem to enhance their innovative capabilities, which are essential for commercializing innovations.

Keywords: dynamic capabilities; commercialization process; strategic choice; innovation

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A central concern of a firm’s overall strategy and management is to maintain a dynamic fit between what the firm has to offer and what the environment dictates (Miles and Snow, 1978). As such, a firm must possess the essential capabilities in order to reconfigure, renew and redeploy its resources and capabilities constantly to capture and exploit the changing opportunities better (Teece, Pisano and Shuen, 1997; Lau, Man and Chow, 2004). As highlighted by Lee and Kelley (2008), the dynamic capabilities perspective provides a useful theoretical lens for investigating innovation at the organizational level. The focus of our current research is to examine the role that a firm’s strategic choice has on the creation and evolution of its dynamic capabilities.
Within this research, we also discuss the unique contextual role of our firms’ innovation and microeconomic business environment that may influence the ability to develop their own capabilities towards the commercialization of their innovations. In our study, we focus on the early phase of the commercialization process. This phase is characterized by familiarizing potential customers with the product idea, preparing the market by building firms’ legitimacy and increasing the visibility of the business, building relationships with potential customers and suppliers. These processes often occur in parallel with developing the product itself; thus early commercialization work becomes intertwined with making the product ready for the market.

Although our firms are positioned within a similar business environment (the offshore oil technology industry), their strategic choice may indeed facilitate the degree and type of dynamic capabilities to be developed. Specifically through our approach, we address the central research question of: What role does the strategic choice of the firm have on the process, creation and evolution of its dynamic capabilities during the early commercialization process? With this focus, we also have the opportunity to achieve an understanding of the following: (1) strategies firms employ in advancing their innovations for the market; (2) dynamic capabilities that are identifiable during the early stages of commercialization; and (3) the extent to which strategic choice is attributed to specific dynamic capabilities for innovation.

Theoretical perspective on dynamic capabilities

There has been a considerable amount of research recently focusing on dynamic capabilities. Dynamic capabilities (DC) are the drivers behind the creation, evolution and recombination of other resources into a new source of competitive advantage (Henderson and Cockburn, 1994; Teece et al, 1997). Dynamic capabilities consist of specific strategic and organizational processes such as forming alliances and strategic decision making, which create value for firms within dynamic markets by manipulating resources into new value-creating strategies (Eisenhardt and Martin, 2000). Therefore, the DC approach allows us to study not only the resources firms need to meet the challenges of entering a market, but also the methods and ways of managing these resources to achieve superior competitive advantage.

More specifically, the dynamic capability perspective offers the first attempt to explain how firms can leverage their strategies and change their valuable resources to enable them to confront and overcome multiple challenges over time. For example, Eisenhardt and Martin (2000, p 1107) defined dynamic capabilities as ‘the firm’s processes that use resources – specifically the processes to integrate, reconfigure, gain and release resources – to match or even create market change’. According to Ambrosini and Bowman (2009), these definitions reflect the fact that dynamic capabilities are organizational processes in the most general sense and that their role is to change the firm’s resource base. It could also be argued that dynamic capabilities are built rather than bought in the market, that they are path-dependent and embedded in the firm based on its strategy (Makadok, 2001; Zollo and Winter, 2002; Eisenhardt and Martin, 2000).

The common characteristics of dynamic capabilities across firms are identifiable, and dynamic capabilities demonstrate the nature of ‘commonalities in key features’ (Eisenhardt and Martin, 2000). Wang and Ahmed (2007) argue that it is possible to identify three main components of dynamic capabilities across studies: namely adaptive capability, absorptive capability and innovative capability. These capabilities underpin a firm’s ability to integrate, reconfigure, renew and recreate its resources and capabilities in line with external changes. Adaptive capability stresses a firm’s ability to adapt itself in a timely fashion through flexibility of resources and aligning resources and capabilities with environmental changes (McAdam et al, 2010). Hence, the focus of adaptive capability is to align internal organizational factors with external environmental factors. Absorptive capability highlights the importance of taking external knowledge, combining it with internal knowledge and absorbing it for internal use (Salvato, Sciascia and Alberti, 2009). Innovative capability effectively links a firm’s inherent innovativeness to marketplace-based advantage in terms of new products and markets. Therefore, innovative capability explains the linkages between a firm’s resources and capabilities and its product markets. While Wang and Ahmed (2007) argue that three types of dynamic capabilities are common across different studies, it is reasonable to suggest that some dynamic capabilities are not only firm-specific or industry-specific, but rather reflect the stage of the firm’s development. Thus, we seek to recognize dynamic capabilities previously described in the literature that arise during the process of early commercialization and are closely associated with adaptive, absorptive and innovative capabilities.

Research design – the rationale for a comparative case study

In order to contribute to theory development, the research design has to enable answers to be provided on
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questions such as how, when and why (Bacharach, 1989). We adopted a comparative case study approach to gain new insights involving the underlying processes and relationships between strategic choice and a firm’s dynamic capabilities. We built on arguments suggesting that multiple cases create more robust theory grounded in varied empirical evidence (Eisenhardt and Graebner, 2007). Thus, in choosing a comparative case study design, we aimed to enhance conceptual models of dynamic capabilities (cf Wang and Ahmed, 2007). We therefore wanted more than one case in order to reveal the variety of entrepreneurial experience with technology and commercialization of new entrants in the petroleum sector.

The strategy for selection of the cases followed a homogeneous sampling strategy (Patton, 1990) as we wanted similarity on issues that could possibly interfere with the conceived challenges of the entrepreneurs. Since the research question deals with cognitive issues such as perceptions and experiences of the entrepreneurs, similar external influence was considered important. Thus the following criteria were used for selecting the firms: (1) they should be companies within the petroleum sector; (2) they should be new companies – that is, between three and five years old (in accordance with studies of new entrepreneurial ventures); (3) the companies should be at a stage when they are ready to commercialize their products; (4) they should be technologically advanced companies; and (5) they should be companies operating in roughly similar markets, represented by drilling and subsea operations. A list of potential cases or companies was given to us by the Confederation of Norwegian Enterprise (NHO), four of which matched the above selection criteria. As one company was not able to participate in our project, we were left with three firms, which we named Alpha, Beta and Gamma. These varied somewhat in size, technology and market niche, leaving ample opportunities for exploring a variety of entrepreneurial challenges. They have all achieved high ratings in terms of technological innovation and development as well as support from various research programmes, economic development programmes and venture capital. In comparing such similar units, it should be possible to isolate factors responsible for the differences between them (cf Lipset, 1990). The cases vary in organizational size, and somewhat in technology and market niche. This leaves ample opportunities for us to observe variation among the firms, especially with regard to how strategic choice and ensuing processes may be attributable to specific dynamic capabilities.

Being inspired by an interpretive paradigm (Burrell and Morgan, 1979; Gioia and Pitre, 1990), this study aimed to understand a phenomenon through the interpretations of that phenomenon from those experiencing it (Shah and Corley, 2006). Hence, while interviewing, we talked about aspects of technology development and the petroleum industry in general, in addition to organizational development and early commercialization activities. The study was carried out in close interaction with practitioners who deal with real management situations, a strategy suited to creating managerially relevant knowledge (Amabile et al, 2001; Leonard-Barton, 1990; Gibbert, Ruigrok and Wicki, 2008). The study encompasses in-depth, semi-structured interviews with the CEOs and members of the management teams of the selected firms. The informants were selected to provide a balance of opinions from different professional areas as well as different levels of responsibility and seniority in an attempt to gather and integrate a variety of perspectives. However, we chose to interview CEOs and management as we believe they can adequately reflect the firm’s situation and visions.

Research has shown that in small and newly established organizations whose structure is less formal, such decisions are often taken by the owner-manager (Mintzberg, 1979; Greiner, 1988; Chandler and Hanks, 1993).

Data collection strategy

Data were collected through a series of interviews (organized between October 2008 and September 2009) with members of the management teams and CEOs of the companies. Three interviews with each company were carried out in the period October 2008–February 2009. In order to obtain a more external view of the challenges small innovative companies face, as well as the views of potential customers and the industry environment in general, we also interviewed external experts and possible partners. Additional telephone interviews were conducted with each company during September 2009. Altogether, 15 interviews were conducted during three rounds between October 2008 and April 2009: four within each company, two within two different oil companies and one with a board member/business adviser. Finally, unobtrusive measures of company information were gathered in order to verify the information received through the interviews. Thus, analyses of ‘written’ information from sources such as business registries, websites, firm presentations and press/newspaper clippings, public debate and industry journals were carried out.

The interviews lasted one hour on average and varied from 10 to 22 pages in length when transcribed. Based on the research question as guidance, three of the authors independently read the transcripts, sorted and coded the data. This process was performed within each case. The process of coding was executed through...
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finding significant statements related to theoretical themes: that is, the strategic choice and dynamic capabilities within each firm. Comparison and selection of statements were performed across the cases. Finally, we used intuitive and critical reflection in interpreting the data. This was performed within as well as across cases (cf Ayres et al., 2003). Quotations from the interviews provided evidence for the various themes of interest. The quotations were first translated from Norwegian into English, and then edited slightly, following the main rules of Rubin and Rubin (1995). Following the advice of Strauss and Corbin (1990), we named the strategies and dynamic capabilities by continually comparing the data with the existing literature.

Description of cases

The three companies, Alpha, Beta and Gamma, are developing products that can be characterized as innovative. By innovation, we mean any kind of innovation that will induce change, associated with new knowledge or technology (radical innovations) or incremental innovations that result in radical or discontinuous innovations (that is, small changes having large effects and the input of new knowledge can push firms into radical new directions; Rice et al., 2002). All the firms are at a stage when the technology is mature enough to start the commercialization process, or else they have already started. The characteristics of the three companies are summarized in Table 1.

While each of our firms is focusing on innovation and developing innovative products for the petroleum industry, they differ in how they define and choose the most appropriate strategy that fits both their short- and long-term intentions. The following strategies were identified in the interviews:

(1) To develop a product, commercialize and exit. A developmental approach seems best suited here. Resources are acquired when needed and technical development seems to be of high priority. The organization is in accordance with the strategy of development of the product and these two processes seem to be balanced. This strategy was chosen by Alpha.

(2) To develop a product, commercialize and stay in the market providing both product and service. This strategy is meant to accumulate all the necessary resources for a sharp start and to stay, so as to

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become a sustainable game changer. This strategy also requires a considerable amount of resources, both financial and organizational. Therefore, a larger focus is on organizational development than in the first case. Beta is applying this strategy.

(3) To ally with an existing industrial partner for commercialization of the product, and eventually exit in the long run. Case Gamma is applying this strategy.

We now describe each firm’s strategic choices and the supporting processes they adopt in pursuing their strategies.

(1) To develop a product, commercialize and exit. Alpha’s strategic intent is to develop innovative technology, commercialize it and eventually exit. Due to the extremely high costs in establishing and operating a drilling and exploration rig, the company focuses on developing the technology individually for the main components of the rig and commercializing them individually. The firm is quite open about the fact that it may not get as far as completing a fully automated product, which actually may be acquired by one of the large, established rig companies.

‘…at some point in time there will be either a sale or a merger or a joint venture or something like that. Our core competence is early-phase, cutting-edge technology innovation. Technology development. That’s what these people have been selected for.’ (CEO, Alpha)

The company has an active business design consisting of the gain and release of resources using consultants, and is also active in selecting suppliers to provide technology for its innovation.

‘As I see it, it’s better either to be tiny or huge. To be in between quickly leads to a lot of problems.’ (CTO, Alpha)

In order to succeed in its strategic intent, the firm uses a number of processes and/or procedures to ensure the successful commercialization of the product. These include restructuring, building legitimacy and approaching potential customers.

For example, Alpha recruits for new functions when the product is entering a new stage. An example of this concerns ‘industrial sales’, for which it has contracted a consultant for two days a week. This consultant is also a member of the board and former manager for industrial developments in an oil company that is Alpha’s most important technology partner and potential customer.

Thus, the firm is utilizing part of its rich resource base, which is represented by the board of executives. Using experienced personnel who are well versed in the industry gives the company a quicker start when setting up new functions, and demonstrates an important step to reposition the company.

‘…In the beginning it will be part-time work, by partly new people and partly by myself, more or less… The first sale like a pilot, I think we have to use the resources that we already have and some new resources… But when we have done the first sale, we will start building; one business development manager full-time.’ (CEO, Alpha)

(2) To develop a product, commercialize it and stay in the market. Beta has another strategy, as it intends to build an organization that will be a larger high-tech supplier company remaining in Norwegian ownership.

‘Our strategy is not to be acquisitioned by others. We are going to have the production capacity, we’re going to have the competence, we’re going to have direct customer relations, we’re going to have the services and the organization needed.’ (CEO, Beta)

Beta’s strategic intent is to develop innovative technology, commercialize it and stay in the market providing drilling and exploration services. Beta has an open-book agreement with three potential customers who are also part-funding the development of the technology. It has also managed to secure a high level of financial funding.

Further, in contrast to Alpha, it has a strategy of hiring the competence needed on a long-term basis and limiting its use of consultants. Beta has hired a competent management team who know the industry from the inside, which enables them to build reciprocal dialogue with potential customers:

‘My competence is viewed as attractive because I had knowledge of oil companies’ way of thinking and doing business. You easily enter a good dialogue, get mutual respect... and that means a lot, since they are our super customers. I think this has been of great value.’ (CEO, Beta)

Beta also has hired competent technical staff. Furthermore, its first priority is hiring; its second is using external expertise:

‘In some cases there is competence you really would have liked to have in the organization. Because these persons already are in a favourable situation (they
will soon be retired, or need to work in a network to keep up their competence) you are not able to employ them. But we want to link them to the company as tightly as possible so that all the know-how will be shared and remain in the firm.’ (BM, Beta)

(3) To ally with an existing industrial partner for commercialization of the product and exit in the long run. Gamma’s strategic intent is to develop innovative technology and commercialize it in partnership with an established complementary supplier (contracting strategy). The founder first had a strategic intent to build a larger company and had a 5-year development plan. However, he was not able to find investors. Therefore, the new strategy was applied.

Innovation is dependent on other technology, and must be integrated with other products or services to be of use. The technology has been developed through a ‘stop-and-go’ strategy, stopping when funds were not available and going one step further when funds were available. In terms of funding for technology development, the company has received a grant from a governmental support programme, plus another grant financed in equal parts by the governmental support programme and industrial partners in its portfolio. A further grant still has not been used as the company needs an industrial partner to participate. The company was nominated for a prestige award and received some attention in the mass media. In terms of advertising, it has an Internet page with a 3D film and some information brochures.

However, no additional processes or resources are being developed for further promoting the company. As mentioned by the founding entrepreneur:

‘I think about all the financial investors I have been in contact with, they invest in everything from drilling rigs to transportation systems. I have used lot of time to develop systems and equipment. But I have not made a glossy prospectus where all features are described…’ (CEO, Gamma)

The entrepreneur has not yet partnered with investors, and the organization consists of only one person: himself. He also used an industry consultant to help him in negotiating contact with a larger company, but the process was not easy. The entrepreneur states that he was unable to assess the market size and, in contrast to other firms, Gamma’s product is dependent on finding a market niche where it will facilitate the implementation of other technology. His strategy thus became that of finding business partners who were willing to use and invest in his technology as part of a larger ‘package’.

From strategy to the development of a firm’s dynamic capabilities

The role of dynamic capabilities is to have an impact on the firm’s extant resource base and transform it in such a way that a new bundle or configuration of resources is created for competitive advantage (Ambrosini and Bowman, 2009). We begin this section by presenting the way in which adaptive, absorptive and innovative dynamic capabilities are demonstrated in our three firms.

The creation and evolution of adaptive capabilities: case illustrations

When thinking about adaptive capabilities, two issues should be considered: first, whether or not the new product is to be adapted technologically to the existing market; and second, whether a company as an organization tends to adapt to the changing external economic environment. We will now illustrate the technology and organizational adaptive capabilities of our cases.

Alpha’s technological strategy is to develop each module as a closed system. As explained by the CTO, it is important that this system can be adapted easily to other equipment and existing technology:

‘If we go to another supplier and look at a drilling system, everything is integrated. They have a common power supply, common communication. They have a very integrated control system. This means that when running operations the main control is much more entangled, like one large system with many machines. We have a strict philosophy that every single machine shall be its own individual which will handle everything itself: all closed-loops, control loops all will be inside the machine.’ (CTO, Alpha)

Alpha also developed capabilities to involve potential customers in the project. As one outcome of these efforts, the Norwegian Oil Company has invested money in the product development.

‘One advantage is that we work together with the industrial development department of Norwegian Oil Company, having a program committing the use of technology. They can commit to use the first part, and after that it will be a commercial transaction. When being involved in this program, the product is tested as a pilot, without competition from anybody else. When the pilot is tested then you are on commercial terms and have to compete.’ (CEO, Alpha)

Thus, involving potential customers in product development seems to enable an adaptive capability in terms of obtaining knowledge about the needs of the customer. In
this case, the customer is also a partner in a project funded by the Research Council. It has invested in the company and it is making its internal expertise available to Alpha.

It can be concluded that technical adaptive capability is an important driver of innovation for Alpha. In terms of organizational development, the company is following its original plan, extending the organizational structure in line with the product development process. In this way, the firm is adapting to internal needs to a greater extent than to the changes in the external economic environment. This provides a good balance between the organizational development and product development processes.

The interviews with Beta do not support similar processes in integrating its technology with existing solutions. This is because its product is intended to replace existing technology and integration into the existing technical solutions is unnecessary. The company also plans not only to provide the product, but also to supply services around the product. This makes adaptability an even less necessary requirement for the new product development process. At the same time, in terms of organizational adaptive capability, we have observed the reconfiguration of the resource allocation within the company due to the unexpected technical challenges. The aim was to focus the technology development further and to shield it from the commercial parts of the organization. The motivation for this was also led by the fact that it was using more time to develop the technology than had been foreseen in its project plans. This placed more strain on the organization (also financially) and forced it to focus its activities. We view this as an example of adaptive capability.

Gamma’s technology is equipment to be used in combination with remotely operated vehicles (ROVs) or unmanned submarines. In our third interview, the CEO described a different position from the other two firms: that of being the subject of a technology search from a larger company:

‘They have a new technology, they’ve been scanning the market, and they’ve found that the systems I have, they fit as a tool for installing this new type of technology.’ (CEO, Gamma)

During the course of our project, the CEO of Gamma discovered several new uses for his innovation. In order to enhance the market for its technology, Gamma may benefit from customers selecting different technology from that which dominates the market today. This is not necessarily linked to Gamma’s own product, but to innovative technology developed by other firms. It can be concluded that Gamma depends heavily on adaptive capability due to both future product characteristics and its strategic intent to ally with a larger firm. In terms of organizational development, the entrepreneur was forced to change his initial plan to develop a company due to an inability to attract reliable investors. In response to these external challenges, Gamma chose to change its strategic intent to an alliance strategy. It can therefore be concluded that Gamma has adapted to the challenges in the external economic environment.

We may conclude that Alpha demonstrates technically embedded adaptive capabilities that Beta does not seem to need. Gamma, however, appears to have the potential to benefit from the adaptive capabilities of larger firms. In terms of organizational development, Gamma has been in an adaptive process to a larger extent than both Alpha and Beta.

The creation and evolution of absorptive capabilities: case illustrations

Alpha has applied technology searches in several other industries, including robotics, space and the car industry. It identifies technology from other industries, integrates, modifies and develops it with petroleum technology for application in drilling and exploration activities. Thus, the company makes use of technology gaps between petroleum and other industries. It uses suppliers ranging from local industry to international universities to help it develop and produce the individual components, which it then assembles. The CTO describes how the firm learns through its suppliers and in the process of selecting those suppliers:

‘We [make] specifications for how it will function, and then we approach three vendors. Then we ask “how would you have made it, and what will it cost us? What are the pros and cons?” And then we sit down and compare. Then we learn from all of them, and we can pick the one doing the best job.’ (CTO, Alpha)

Alpha has a strategy on what kind of traits it looks for when choosing suppliers. The company deliberately selects suppliers who are open to trying new things, are innovative, and who understand their needs. It is extending the boundaries of its resource base to encompass other firms and their competencies.

‘ …If they return with something that looks as much as possible as what they made last time, then maybe they are not the right people. But if they come back with something and say “oh, we think this is going to be the best for you”, that they’ve been thinking new technology. Then we’ll use them.’ (CTO, Alpha)
Making specifications for suppliers is part of the product development process. Having potential suppliers offering their solutions represents a way of comparing ideas and extending the resource base of the organization. Through this process, absorptive capacities are developed. Alpha has also developed an iterative routine, which it follows:

‘We know that nothing we make will be identical with the prototype sent out for sale. We have added an iterative process when we build a prototype, we go through it, and write down all the things we are not pleased with and then we have to revise and rebuild.’ (CTO, Alpha)

On the other hand, Beta uses technology searches in universities and develops technology to perform close to what they claim is theoretically feasible, as well as implementing technology from other industries. In order to handle technological challenges, Beta outsources certain aspects of the technology searches. Beta is constantly in the process of searching for technologies from other fields to be implemented:

‘…So, it’s the whole… to hunt, to be curious, make use of other industries. Space, military technology, which has solutions, we are using valves in [the product] which are in Formula 1 cars and can endure extreme heat. And then we test it to the extreme, far more than we actually need.’ (CEO, Beta)

Again, not having built his own organization, Gamma’s CEO seems to have adapted less formal requirements for suppliers; however, there is a focus on quality.

‘I’ve spent a lot of time on sub suppliers. What I spent the most time on was actually finding out who would be the best for solving different tasks.’ (CEO, Gamma)

There seems to be a difference between the three cases in the degree of involving partners. Whereas Alpha uses partners actively for developing the technology, Beta uses them less actively. Finally, Gamma outsources all of its technology – building and assembly. Alpha seems to be more open in its technology searches and interactions with partners. The CEO of Beta told us that the company was careful to protect intellectual property, that names of employees were not on the website and that the suppliers were not allowed to use the company as a referee. Our impression is that Beta is more protective of its technology development and thus has less open interaction with actors in the environment. Gamma seems to have used well qualified suppliers to build and assemble the technology, and expressed no concern over losing technology know-how to them. However, in dealing with potential business partners and alliances, Gamma expressed much more concern for retaining intellectual property rights within the company.

These observations suggest that Alpha and Beta are somewhat different in developing their absorptive capabilities, in that Beta relies more on internal resources. Not having developed his own organizational resources, Gamma’s CEO relies heavily on his own network, but expressed concern over his lack of capabilities. The quotations illustrate the role of absorptive capabilities in two of the firms. Our observations are in line with previous findings. The ability to learn from partners, to integrate external information and transform it into firm-embedded knowledge has been found to be positively associated with outcomes salient to the oil and gas industry (Voiceshyn and Daellenbach, 2005).

The creation and evolution of innovative capabilities: case illustrations

Managers shape and develop their organizations. In small entrepreneurial companies, managers have more influence on the course of the organization’s development. Alpha, Beta and Gamma are established around an innovative idea, and thus building infrastructure that might support the development of the idea is of crucial importance.

The ideas of Alpha come from mapping technology gaps, combined with a signalled customer need. The quotation below illustrates that the ability to identify a technology gap can be perceived as important for the innovation capability of the firm.

‘The background was that we had a network, the four entrepreneurs, focusing on technology gaps in drilling and well technology. We got some funding from Norwegian Oil Company to make a report about which technologies could be interesting. And then we presented seven technologies and ranked them, and Alpha was one of the projects. It’s funny because it wasn’t given that this would take us further. But Norwegian Oil Company stuck their neck out and said that it could be very exciting to start something like that.’ (CEO, Alpha)

The product idea for Beta was patented by a research institute, but no steps had been taken to commercialize it until the venture fund took the initiative. The ability to act on ideas that can produce new-generation technology seems to be an important part of innovation capability.

‘What happened was that Venture Company took the idea and established Beta in 2003. To apply for this
type of funding from the Research Council it has to be company based, and in connection with this the ownership of the patent which was filed at the research institute was transferred to the company.’ (CEO, Beta)

The product idea forming the basis for establishing Gamma stemmed from personal experience working on a failed development project in a larger firm. The ability to see the technological gap that can be filled can be seen as a critical part of the innovative capability.

‘When I started working on this problem, I couldn’t solve it while being in the company. I kept on working at it and finally I had an idea [for] which I applied for a patent. And that was the start of Gamma firm.’ (CEO, Gamma)

Alpha also has a clear preference related to human capital. The company is conscious of recruiting people who are open to innovation; if they are too much into traditional technology, it is difficult to obtain the high degree of innovation needed in the product.

‘Important in this technology development are the innovation projects. It’s “state of the art”. That’s why it’s important to hire innovation people. If they remain too much in traditional technology, it’s hard to get high degree of innovation. The same goes for our collaborative partners. They’re chosen because they show an enthusiasm for innovation and new approaches.’ (CEO, Alpha)

‘We’re very much based on consultants. Because it takes a long time to build staff. So you could say we are six employees and in principle six man-years working as consultants for the company.’ (CEO, Alpha)

In Alpha, the product development is organized in a multi-skilled team working together:

‘… we don’t have anyone who is somebody else’s boss, here everybody has their own field of expertise. One engineer is in charge of mechanical engineering, another one has control systems, one is working on the simulator side and so on. It’s really a multi-skilled team working together.’ (CEO, Alpha)

Beta has a more diversified organization in terms of acquiring human capital:

‘The starting point is that we recruit senior people with experience first. They build these two different parts of our organization. Then they handpick people they have experience or worked with. In addition, we recruit some young people who haven’t made all these experiences. Sometimes, you need to have somebody asking stupid questions. You have to challenge established practice. Young people are good in doing this because they don’t take anything for given. There has to be a mix between these two groups. To have the experienced people get in place first and have them let them shape things has turned out very well in our firm.’ (BM, Beta)

Furthermore, its first priority is hiring, with its second being using external expertise:

‘In some cases there is competence you really would have liked to have in the organization. Because these persons already are in a favourable situation (they will soon be retired, or need to work in a network to keep up their competence) you are not able to employ them. But we want to link them to the company as tight as possible so that all the know-how will be shared and remain in the firm.’ (BM, Beta)

The strategy of separating the product development from other processes in the firm gives results, according to employees at Alpha:

‘No matter how you twist and turn it, the largest obstacle in all development projects is to be allowed to focus on the project and be able to control the resources. When I started in Alpha, the pace of product development was new to me. I have never seen it happen before. It’s because we work on one thing here. This is development! We have no customers, nothing like that! We are allowed to have focus.’ (CTO, Alpha)

The organizational development of Gamma has followed a different course. Actually, Gamma has not developed its own organization. Instead, the CEO is grappling with the challenges himself, aided by his own network and an industry adviser.

‘In this process I have done everything from marketing to technology development, and writing contracts. And I don’t find all of it equally fun to work on, so to speak. Some tasks take a lot of time because you don’t have the competency, and then you have to use your network to try and find out which agreement will work for this situation, and then try to create that particular agreement. You spend a lot of time doing this.’ (CEO, Gamma)
**Taking innovations to market**

Alpha and Beta have separated the strategic decision making from the technological development process. In Beta, it may be argued that protecting the technological development from market pressures is an important component in focusing the technological development and thus enhancing the innovative capability of the firm.

The open exchanges with potential first customers give a perspective on the innovation process. For Alpha, it may be argued that the relatively open process, with inputs from suppliers, research institutes and customers, makes a richer resource base of knowledge and knowledge-enhancing capabilities. As demonstrated above, Gamma’s CEO has not developed a differentiated organization, and struggles with acquiring sufficient skills and talent within his network.

**Summarizing the relevancy of strategic choice to dynamic capabilities**

While our findings and interviews with each of our three firms revealed marked differences in their overall strategic choices, there were several overlapping areas in the development of their dynamic capabilities. Again our research intention was to elucidate the role of the firm’s strategic choice in the process, creation and evolution of its dynamic capabilities during the early commercialization process. This further allows us to achieve a threefold purpose towards our understanding of (1) the strategies firms employ in advancing their innovations for the market; (2) the dynamic capabilities that are identifiable during the early stages of commercialization; and (3) the extent to which strategic choice is attributed to specific dynamic capabilities for innovation.

As shown in Table 2, we integrated strategic choice, dynamic capabilities and the intersection of these two to capture how choice was ascribed to specific capabilities. From our interviews, we summarized our key findings on the strategy matched to each of the dynamic capabilities and its attributes. We then assigned levels to each of the capabilities (high, medium, low) to depict our observations from our interview data. We also produced within each capability a brief summary of how each firm, based on its strategic choice, developed that specific capability (for example, for Alpha, with a strategic choice to exit and with absorptive capabilities, one of its key attributes was to absorb technology from other industries, collaborate with research institutions, etc). This summary of our findings illustrates how our firms aligned their strategies and emphasized similar as well as different dynamic capabilities as they were embarking on the early stages of commercialization.

As mentioned, dynamic capabilities describe the process of how firms develop the best fit of resources and core capabilities in relation to their strategic choices and intentions. Thus, it is not only about building resources, but about creating the right combination and balance of resources and capabilities based on the overall strategic choices and intentions of the entrepreneur/entrepreneurial team. As revealed in our three cases, we found that the role of strategic choice was factored into the processes they used to create and build their own set of dynamic capabilities. Certain dynamic capabilities were emphasized and appeared to be more

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**Table 2. Relevance of strategic choice by dynamic capabilities.**

<table>
<thead>
<tr>
<th>Dynamic capability</th>
<th>Alpha</th>
<th>Beta</th>
<th>Gamma</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strategic choice</td>
<td>Exit (to develop product and sell the company)</td>
<td>Remain (to develop product and stay in the market selling the product as a service)</td>
<td>Alliance/exit (to develop product as part of a bigger package or service provided by the partner company)</td>
</tr>
<tr>
<td>Adaptive technological</td>
<td>High (product to be integrated with existing technology)</td>
<td>Low (product does not need to be integrated into existing technology)</td>
<td>High (product can function only as complementary to other technology)</td>
</tr>
<tr>
<td>Organizational</td>
<td>Medium (organizational development to meet technological development and commence commercialization)</td>
<td>Medium (organizational restructuring to meet the challenges of market pressure)</td>
<td>High (changed its strategy from developing independent organization to alliance)</td>
</tr>
<tr>
<td>Absorptive</td>
<td>High (absorb technology from other industries, collaborate with research institutions, seek competence from consultants and suppliers)</td>
<td>High (absorb technology from other industries, cooperate with research institutions, develop unique competence inside the company)</td>
<td>Medium (the initial idea for the product is taken from a technologically unrelated field; has done most of the technology development himself)</td>
</tr>
<tr>
<td>Innovative</td>
<td>High (product idea is innovative, based on existing gap in practical application; innovative key employees, uses innovation-oriented consultants, innovation-oriented partners; concentrated work of technical staff on product development)</td>
<td>High (product idea is innovative, research-based; innovative employees, innovative partners, protecting know-how carefully; protecting technical staff from market pressure to facilitate product development)</td>
<td>High (product idea is innovative, based on existing shortcomings of technology; searches for innovation-oriented partners; expressed a need for concentrated product development process and for assistance with commercialization)</td>
</tr>
</tbody>
</table>
relevant based on the strategic intentions of the CEO or entrepreneurial team. For example, Case Alpha’s focus on technology development, commercialization and exit favoured those processes and capabilities that were adaptive. On the other hand, Case Beta’s focus on organizational development and its ‘commercialize and stay’ strategy was more biased towards capabilities that were absorptive. Because it was difficult to discern the strategic choice of Case Gamma, the link between strategy and capabilities was less apparent.

What was surprising in our interviews was the range of dynamic capabilities that existed in practice and their consistency with theory. While our firms were at an early stage in their commercialization process and organizational life-cycle, we were able to uncover many of the core capabilities found in the literature and existing research. That said, from the firms’ strategic intentions and processes to support their strategies, we found that many of the dynamic capabilities were created and operated both singly and in combination with others.

Limitations of our research

As is the nature of studying dynamic capabilities over time in our firms, we are still in the nascent stages of examining the creation and evolution of their dynamic capabilities. A longitudinal case study approach consisting of the continuation of interviews with the founders and successors will assist and enable us to examine the drivers, processes and core capabilities essential to the development of adaptive, absorptive and innovative capabilities.

Equally important would be a follow-up quantitative study to examine these capabilities and develop new scales relevant for firms commercializing new technologies. Until then, we base our early assumptions on the initial capabilities and resources these firms used in launching their ventures and first initial successes in prototype development. That said, this research is one of the first to investigate the role of strategic choice and dynamic capabilities during the early stages of the commercialization process.

Conclusion

As the research continues, our work has the opportunity for an engaged scholarship approach that crosses multiple disciplines in business and science and adopts a reciprocal, collaborative relationship with industry to inform, disseminate and share many of the leading and emerging practices on the commercialization of innovation. Our informants have had the opportunity to read and comment on earlier versions of our project work. In one case, the informant reported back that seeing the form through ‘the eyes of others’ had been an enlightening learning experience in its own right. As such, our own research approach becomes dynamic and in multiple ways is characteristic of how our firms integrate and leverage their own learning to assess their own strategies and build capabilities to introduce market innovations for tomorrow.

Notes

1 The authors have contributed equally to this paper.
2 We deleted some of the oral ‘fill words’ in order to make the informants’ message clearer. Sometimes the informants gave us additional information about a theme either later in their answers or later in the interview. We then connected the quotes so as to get a better meaning across to the reader. The sign ‘…’ denotes that there could be other sentences in between. We carefully registered displayed emotions such as enthusiasm, engagement and discouragement. The sign ‘!’ underlines such utterances.

References

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