

# Dynamic capabilities in entrepreneurial firms: A case study approach

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**Abstract** Three entrepreneurial case studies in Canada show that changes in the environment—such as changes in customers’ needs and changes in competitive products—are the major sources of opportunities. To recognize and exploit these opportunities, the firm needs entrepreneurial capabilities. At the same time, to gain long-run competitive advantage, the firm needs dynamic capabilities. The case findings show that entrepreneurial capabilities have circular and iterative relationship with dynamic capabilities—each reinforces the other. The more often the iteration takes place, the stronger entrepreneurial capabilities and dynamic capabilities are. Further, the study builds on the extant literature and develops a new method to capture dynamic capabilities through capturing changes in ordinary capabilities.

**Keywords** Dynamic capabilities · Entrepreneurship · Entrepreneurial capabilities · Entrepreneurial firms · Case study · Theory building

## Introduction

Entrepreneurial firms are characterized as having the capabilities to find opportunities and exploit the opportunities by creating future goods and services (see e.g., Shane 2000; Stevenson and Jarillo 1990; Venkataraman 1997). At a macro level, national economy level, these firms regardless of their size and resources they control, have

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high-growth potentials. Empirical evidence shows that the growth of entrepreneurial firms plays a significant role in job creation and economic development. For example, a study conducted by van Stel et al. (2005) in 36 countries shows that, with different levels of impact, entrepreneurial firms contribute to the national economic development and growth of these countries.

At the micro level, firm level, however, entrepreneurial firms are characterized with volatile business environments subject to rapid and unexpected changes. The changing environment is a source of opportunity and at the same time a source of threat for the firms (Porter 1985). To succeed in the short term, an entrepreneurial firm needs entrepreneurial capabilities to identify and exploit opportunities in the environment. To survive and gain competitive advantage in the long run, the firm needs dynamic capabilities that enables the firm to protect its existing competencies and resources and create and deploy new competences and resources against rapidly changing environments (Teece 2007; Teece et al. 1997). In effect, entrepreneurial capabilities and dynamic capabilities are vital to both short-term success and long-term survival of an entrepreneurial firm.

Although a few studies have been conducted on this topic (see e.g., Jantunen et al. 2005), however, the relationship between these two types of capabilities has remained under-researched. This study by adopting a qualitative theory building approach (see Eisenhardt and Graebner 2007), examines the relationship between firm's entrepreneurial capabilities and its dynamic capabilities—in particular, the relationship between the firm's capabilities to recognize and exploit opportunities in the environment and its dynamic capabilities. To do so, case studies are conducted on three software entrepreneurial firms in Canada. After collecting the field data (through interviews), ATLAS.ti software program is deployed to codify and interpret the case findings. Then the findings are triangulated with the extant literature to draw a conclusion. This study contributes to the extant literature by utilizing a new method to capture dynamic capabilities and changes and dynamism of firm's environment as major sources of opportunity recognition. Further, the study builds on the extant literature to show that the dynamic capabilities approach is applicable to capability analysis in entrepreneurial firms. The study consists of the "Theoretical background" section, the "Research method and design" section, the "Analysis and discussion" section, the "Conclusion" section, and the "Limitation of the study and need for further research" section.

## Theoretical background

### Dynamic capabilities: The phenomenon

Since its inception in late 1990s, the dynamic capabilities view (DCV) has gained significant popularity and acceptance among scholars (see, e.g., Katkalo et al. 2010; Kraaijenbrink et al. 2010). DCV has its roots resource-based view (RBV) theory of the firm—another widely recognized theory of the firm among scholars. In RBV, the firm's competitive advantage relies on the application of a bundle of resources (Barney 1991; Wernerfelt 1984; Rumelt et al. 1991), which are static. In DCV, however, competitive advantage relies on the firm's capabilities, which are dynamic.

From this point of view, dynamic capabilities are considered as a “firm’s abilities to integrate, build, and reconfigure internal and external competences to address rapidly changing environments” (Teece et al. 1997: 516). These capabilities support superior long-run business performance (Teece 2007). For example, product development routines are dynamic capabilities by which managers combine their varied skills and functional backgrounds to create revenue-producing products and services (Clark and Fujimoto 1991; Dougherty 1992; Eisenhardt and Martin 2000; Helfat and Raubitschek 2000). Similarly, strategic decision-making is a dynamic capability in which managers pool their various business, functional, and personal expertise to make the choices that shape the major strategic moves of the firm (Eisenhardt 1989; Fredrickson 1984; Judge and Miller 1991).

As shown in Table 1, on the sources and the processes of creation of dynamic capabilities, two perspectives can be identified in the literature: exogenous perspective and endogenous perspective. From the exogenous perspective, the sources of dynamic capabilities are changes in the external environment. These changes consequently cause the firm to modify its competencies and resources to align them with these changes (see, e.g., Eisenhardt and Martin 2000; Teece et al. 1997; Wheeler 2002; Zollo and Winter 2002). In this view, dynamic capabilities come into existence and coexist with the changes in the environment. In other words, dynamic capabilities are made to align the firm’s competencies and resources with the changes in the environment. At the same time, this alignment must be strategic and purposeful, not ad hoc and random. For instance, Winter (2003) argues, “if a firm adapts to the changes in the environment in an ‘ad-hoc problem solving’ or ‘fire-fighting’ mode, it does not necessarily exercise dynamic capabilities” (p. 992). Zollo and Winter (2002) similarly suggest that “dynamic capability is exemplified by an organization that adapts its operating processes [to the changes] through a relatively stable activity dedicated to process improvement” (p. 340). In this view, to cope with the future changes in the environment the firm strives to make stronger dynamic capabilities—e.g., stronger business processes and routines. In effect, the causes of creation and modification of dynamic capabilities are exogenous to the firm’s own internal activities.

From the endogenous perspective, however, the sources of dynamic capabilities are changes in the firm’s internal ordinary capabilities (also called “substantive capabilities”). For instance, Winter (2000) argues that “defining ordinary or ‘zero-level’ capabilities as those that permit a firm to ‘make a living’ in the short term, one can define dynamic capabilities as those that operate to extend, modify or create ordinary capabilities” (p.991). For example, “new routine for product development is a new substantive capability but the ability to *change* such capabilities is dynamic capabilities—and just as a firm has many substantive capabilities of varying

**Table 1** Perspectives on the sources and the processes of creation of dynamic capabilities

	Sources of dynamic capabilities	Creation of dynamic capabilities
Exogenous perspective	Changes in the environment	Through a strategic process
Endogenous perspective	Changes in substantive capabilities	Through a strategic process

strengths, it has many dynamic capabilities of varying strengths” (Zahra et al. 2006: 921). In this view, dynamic capabilities are created through a process of changes in substantive capabilities. In other words, the causes of the creation and modification of dynamic capabilities are endogenous to the firm’s activities. In this view, unlike the former view, the firm creates and modifies its dynamic capabilities on regular basis. In effect, dynamic capabilities coexist with substantive capabilities, regardless of the changes in the environment.

As shown in Table 1, although there is a difference of opinion on the sources and causes of dynamic capabilities, there is no difference on the processes of creation of dynamic capabilities. In both perspectives, dynamic capabilities are created through a relatively long process. This process, if it is strategic and purposeful, contributes to the firm’s superior performance such as superior rent-creation or competitive advantage (see, e.g., Teece 2007; Zollo and Winter 2002). Both perspectives have merits and acceptance among scholars, so here we refer to dynamic capabilities as firm’s abilities to purposefully change and improve its substantive capabilities to respond to the changes in the environment.

### Entrepreneurial firms: The context

The changing environment for entrepreneurial firms is the surrounding situation that influences the behaviors of the firms (Gartner 1985). In the entrepreneurship literature, entrepreneurial firms are referred to firms with the ability to *identify* and *exploit* opportunities in this changing environment. For instance, the Austrian school of economics views entrepreneurial firms having capabilities of identifying short-term market inefficiencies (which represent deviations from the economic equilibrium state), taking action to exploit these, and thereby driving the economy towards equilibrium (Mises 1949; Hayek 1978; Kirzner 1997). Examples include situations where a production factor has been incorrectly priced (not reflecting the true market-clearing price) or where simple arbitrage can be performed (buying low in one market, and immediately selling higher in another market). The essential distinguishing capability of these firms is therefore the ability to scan the environment more effectively and to better interpret and recognize the opportunities lurking in the inefficiencies of the environment. Entrepreneurial firms performing this function can be recognized by the rigor and devotion of their scanning practices and by their ability to recognize opportunities implicit in knowledge overlooked by other firms.

Besides having the ability to identify the opportunity, the firm needs to have the ability to exploit the opportunity, either by acquiring ownership and control over the resources or by developing a new product or method of production (see, e.g., Baron and Shane 2008). This perspective arises from the widely used definition of entrepreneurship as “a process by which individuals—either on their own or inside organizations—pursue opportunities without regard to the resources they currently control” (Stevenson and Jarillo 1990: 23). From this perspective, entrepreneurial firms have the unique capability to avail themselves of resources without regard to immediate constraints of capital to pay for those resources, and thereby, to effectively broaden the portfolio of resources and substantive responses their firms can employ. They access and exploit these resources typically through extensive network relationships that permit them to identify sources of resources and to influence how the

owners of those resources employ them to the benefit of the entrepreneurial firms (Larson 1992; Eisenhardt and Schoonhoven 1996). Having this capability allows them greater flexibility and nimbleness in bringing resources to bear on the needs of the firm. In effect, this entrepreneurial capability greatly expands the behavioral variety of the firm and thereby better positions it for competitive success in environments of great complexity or dynamic change (Ashby 1956; Stevenson and Harmeling 1990; McKelvey 2004).

## Research method and design

As discussed before, dynamic capabilities are referred to firm's abilities to purposefully change and improve its substantive (or ordinary) capabilities to respond to the changes in the environment. Based on this definition, to examine the sources and the processes of creation of dynamic capabilities in entrepreneurial firms, we conducted inductive case studies (Yin 2003). A case study inquiry allows investigating a phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident (Yin 2003: 13). The phenomenon under study here, dynamic capabilities and entrepreneurial capabilities, have no clear boundaries with substantive capabilities and other organizational capabilities as part of the firm's context. Besides, the population of the study, entrepreneurial firms' senior practitioners, if they are not provided background information, can make no distinction between these types of capabilities. Therefore, to discuss face-to-face with practitioners and first give them background information about what organizational capabilities and dynamic capabilities are, we decided to conduct an inductive case study.

### Sampling criteria

Based on the research objective—to study the relationship between entrepreneurial capabilities and dynamic capabilities—the major sampling criterion was firms with entrepreneurial activities—i.e., firms constantly seeking for opportunities in the market. In addition, to narrow our research scope, we chose software firms for three reasons. First, software firms, particularly small software firms, have changing business environments (Mathiassen and Vainio 2007). This criterion provides a suitable setting to study the relationship between dynamic capabilities and entrepreneurial capabilities—where changes in the environment are sources of opportunity for the firms. Second, compared to other firms, such as car manufacturing firms, substantive capabilities (or ordinary capabilities) in software firms are easier to understand and easier to conceptualize. Substantive capabilities in software firms include project management capabilities (Ethiraj et al. 2005) and capabilities to design, develop, make, and maintain software products or software services. Regardless the size of the firm (in terms of number of employees), these capabilities are applicable to any software firm. Third, in dynamic capabilities, the unit of analysis can be the firm itself or firm's processes and paths (see Teece et al. 1997). In creating value, with different degrees of strength, a firm might have one or several distinct processes and production paths. Business activities in software firms can be divided

into several projects consisting of one or several processes. Regardless the size of the firm, each project can be a unit of analysis for dynamic capabilities analysis in entrepreneurial firms. Thus, the unit of analysis in dynamic capabilities is applicable to software firms.

### Questionnaire

As shown in Table 2, we designed a semi-structured open-ended questionnaire to assess dynamic capabilities in entrepreneurial software firms. The questions in the questionnaire are based on the definition of dynamic capabilities discussed earlier in the theoretical background. To assess substantive capabilities, we asked the firms to make a software product or software solution, what types of organizational capabilities they use. As discussed previously, dynamic capabilities [here] are referred to the abilities of the firm to change and improve its substantive capabilities. According to this definition, to assess dynamic capabilities, we asked the firms while they are working on a project, do they change and modify their organizational capabilities or

**Table 2** Research questionnaire: Fields and codes

Fields	Codes
Substantive capabilities	<p>What types of organizational capabilities you use for designing and developing your products?</p> <p>Project management skills</p> <p>Product design skills</p> <p>Product development skills</p> <p>Other skills</p>
Dynamic capabilities: changes to substantive capabilities	<p>How often do you change and modify your organizational capabilities?</p> <p>Not changing organizational capabilities</p> <p>Changing organizational capabilities rarely</p> <p>Changing organizational capabilities sometimes</p> <p>Changing organizational capabilities often</p> <p>Changing organizational capabilities very often</p>
Opportunity recognition	<p>How often do you seek for opportunities in the market?</p> <p>Not seeking for opportunities</p> <p>Seeking for opportunities rarely</p> <p>Seeking for opportunities sometimes</p> <p>Seeking for opportunities often</p> <p>Seeking for opportunities very often</p>
Sources of opportunity	<p>What are the major sources of opportunities?</p> <p>Internal innovation</p> <p>Evaluating competitive products</p> <p>Talking to average customers</p> <p>Talking to select customers</p> <p>Other sources</p>

not. If so, how often do they change these capabilities? In this way, dynamic capabilities were assessed by assessing not only the ability but also the frequency of changing substantive capabilities. The frequency of changing substantive capabilities is a measure of dynamic capabilities—i.e., the more frequent the company changes its substantive capabilities, the more dynamic capabilities it has. To assess opportunity recognition capabilities, we asked the firms whether they search for opportunities in the market or not. And if so, how they do it: by talking to the customers (or select customers), by evaluating competitive products, or by other means and methods. Also, we asked them how often they conduct this search for new opportunities in the market.

### Case studies

Based on the sampling criteria discussed earlier, to collect field data we conducted three cases studies on software entrepreneurial firms in Toronto, Canada. The firms were randomly selected from Scott's Canada business directory. We visited the firms and interviewed senior managers of the firms. Based on the questions in the questionnaire (see Table 2), to give the persons answering the questions the choice to give the information that seems to them to be appropriate, the interviews were open ended.

#### GlobeStar Systems Inc.

GlobeStar Systems Inc. is a software development company, headquartered in Toronto, Canada. The company was founded in 1992 and currently employs 53 employees, mostly software programmers and project managers. The company has customers in a wide range of industries in local and global markets. Their major markets are the USA and Japan. The company's core product is ConnexALL, a standard-driven, modular-based software engine. ConnexALL integrates a wide range of communication resources such as nurse call points and alarm buttons to almost any business systems. ConnexALL facilitates operating in industries that are designed to support a variety of applications for different types of workforces like healthcare, education, manufacturing, retail, building management, and transportation industries.

We met face to face and interviewed GlobeStar Systems Inc.'s Vice President of R&D. We posed the questions in Table 2 to him and asked him to explain the processes and capabilities that they use to make their software solutions. Here is what he said about the major organizational capabilities (substantive capabilities) that they use for making their software products/solutions:

... the major organizational capabilities that we use to make our products are project management and product design and development skills. For designing, writing, integrating and debugging software programs, we use a standard development environment called 'Delphi'<sup>1</sup>. At the same time, within this design environment, we use agile design and development method.

<sup>1</sup> A component-based platform for designing and developing Windows applications (source: [embarcadero.com](http://embarcadero.com))

[Agile software development is a group of software development methods based on iterative and incremental development with emphasis on cross-functional team collaboration, customer involvement, and responding to changes (Beck et al. 2001).]

About the changes to their substantive capabilities (their dynamic capabilities) he said:

On the basis of our project technical and customer requirements, using agile method enables us to change and modify our design and development skills frequently. Therefore, throughout a project, we won't need to stick [to adhere] to a particular design and development method. Instead, we can modify and change our method – or we can switch to a different method if we want.

To learn and change our design and development method, we review and evaluate the design and development methods of our competitive products in the market. Also, if new features and attributes of competitive products are brought up and highlighted by our customers, we have to carefully review and evaluate the methods of making those features and attributes. Then accordingly we adapt their design and development method or skills to the trends of change in the market. At the same time, we do not do any reverse engineering on our competitive products in the market

[—i.e., they do not copy or duplicate the design structure of competitive products. They analyze and learn the design and development methods of the competitive products only.]

Then we asked about the sources and frequency of opportunity recognition (their entrepreneurial capabilities). Here is what he said about how and how often they seek for opportunities in the market:

We market and sell our software solutions through dealer networks called independent software vendors (ISVs). To seek for new opportunities, we leverage our dealer networks. Through them, we seek for opportunities and approach our potential customers. Therefore, our dealer networks are the major sources of opportunity recognition for us. For example, when we sign a contract with a customer, from the early stages of a project throughout the entire life cycle of the project, we involve the customer in the project. In other words, the customer becomes an active member of our project design and development. In some cases, our software solutions are completely driven by customer's requirements and ideas. Our larger sales volume comes from so-called 'strategic customers'. Because these types of customers are well aware of the competition and the trends in the market, the inputs and feedback of these customers are quite important to us. Our strategic customers are an important source of opportunity recognition for us. On regular basis, through these two major sources—I mean dealer networks and customers—we seek for opportunities in the market.

## Arkipelago

Arkipelago is a software product development company headquartered in Toronto, Canada. The company was founded in 1989 and employs 20 employees. It has

customers in North America, Europe, and Asia-Pacific. The core product of the company is ROME™ Series Software, a Windows-based management tool for network planning, modeling network assets, and inventory management. ROME™ provides functions for a wide variety of telecommunications network topologies, including Wireline, Wireless, Data/IP, and Access. Its automated processes essentially reduce operational costs and enable customers to maximize the use and maintenance of their infrastructure investment. ROME™ is used by telecommunications carriers and network operators including British Telecom, Energis, MobilCom, MTS, Orange, StarHub, and Vodafone.

Like GlobeStar Systems Inc., we interviewed the Founder and the CEO of Arkipelago face to face. He also emphasized that to make their products, the major organizational capabilities (substantive capabilities) that they use are design and development skills and project management skills. Here is what he said about their organizational capabilities:

To make a software product, the major organizational capabilities that we use are product design and development skills. Also, since we have standard product platform, like ROME™, to some extent, project management skills are important to our operations. We change and modify our design and development methods and skills sometimes. And customers have the highest impact on the changes in our design and development skills.

We started about 20 years ago. Since then, our vertical market has matured and has become more competitive. The competition in the market has also significant impact on the changes in our design and development skills. The competition has increased the customers' product knowledge and has made easier for our company to convince new customers to buy our products. At the same time, however, still our biggest challenge is not making but marketing our products, I should say!

About changes to their substantive capabilities (their dynamic capabilities) he said:

To learn and change our design and development skills, we review few competitive product designs in the market. Usually we receive suggestions and ideas about competitive designs and products in the market from our customers, especially, our lead customers like British Telecom (BT). Our review and evaluation on competitive products and designs are done on products features and outlooks. In rare cases, however, we look into the processes of product development of competitive designs and products. Our vertical market is Telecom and inventory software markets. I should say that in terms of technology and product features and functionalities, in inventory software market we are several years ahead of our vertical market. Thus the market cannot absorb fast enough the new technology that we develop. Currently, we are in a process of changing our business model both in terms of interacting with customers and in terms of competing with other companies. We are concentrating on lower price product ranges that are suitable to individual users and smaller companies.

Similar to the previous case, we asked about the sources and frequency of opportunity recognition (their entrepreneurial capabilities). Here is what he said about how and how often they seek for opportunities in the market:

Well, to seek for opportunities in the market, our software retailers, for example, our retailers in Singapore, screen ideas for new products from end users and identify suitable opportunities for us. Our products are more than 60% driven by users' ideas and requirements and less than 40% driven by our in-house innovations and R&D activities. Therefore, users are the major sources of opportunity recognition for us. Users have significant impact on the trends of change in our business model as well. For instance, currently, most manufacturers and businesses in our vertical market have rather management-driven software environments. However, Arkipelago is trying to promote product-driven software environments. This idea of promoting product-driven software environment has originally come from users through our retailers.

### Information System Architect

Information System Architect (ISA) is a software product development company headquartered in Toronto, Canada. The company was founded in 1992 and currently employs 25 people. It has customers in a wide range of industries in the US and Canada. The company provides IT security, Business Application, and Networking solutions to small and medium-sized industrial customers. One of their core solutions is MAS 500 ERP, an Adaptive Business Intelligence. The MAS 500 ERP is an integrated series of enterprise applications covering all areas of business, including financials, distribution, customer relationship management (CRM), manufacturing, human resources, payroll, project accounting, financial reporting, and electronic commerce.

Similar to the other two cases, the Vice President of Professional Services of Information System Architect in our face-to-face interview told us that the major organizational capabilities that use to make their products are design, development and project management skills. Here is what he said about their product development skills:

Our company does not develop software products from scratch. This means, we adopt generic software systems from our partner development companies. Then based on market opportunities and customers' unmet needs and requirements, we modify the systems; add new features; and provide customized final solutions to the customers. Since for each particular solution our final solutions should communicate with our business partners' development environments—also referred to development framework—we adopt the generic development framework from our business partners. Then we carry out all the design, programming, coding, debugging and testing activities within that particular development framework. Therefore, our design and development methods are agile

[– i.e., they do not adhere to a specific design and development method—they change the method according to each particular project.]

And here is what he said about changes to their substantive capabilities (their dynamic capabilities):

In the beginning of each project, we have to change our design and development methods and skills. Also, since our solutions are project-based and fully customized, project management skills play an important role in our project success. To change our design and development skills, we review and evaluate competitive products in the market. However, we do not do any reverse engineering on competitive products in the market. When an opportunity arises, before we start working on a project, we do the review on competitive products in the market. Then once we select a project and start working on it, we do not review competitive products anymore. Therefore, we change our design and development skills in the beginning of each project only. Our customers and our business partners also do the review and evaluation of competitive products for us. Therefore, we often receive feedbacks and comments on our competitive products via our customers and business partners.

Finally, we asked about the sources and frequency of opportunity recognition (their entrepreneurial capabilities). Here is what he said about how and how often they seek for opportunities in the market:

Our company fills the gap between software authors and software customers. Therefore, our major source of opportunity is identifying and filling this gap. In many cases, this gap is very wide, which leaves lots of opportunities for us. Some of our solutions are totally customer-driven solutions that are built to address specific customers' unmet needs and requirements. Therefore, our company constantly communicates and interacts with potential customers to identify new opportunities. Our business partners are large industrial companies. Through their customer networks, these partner companies also help us to identify opportunities in the market. Therefore, I would say, the major sources of opportunity recognition are our own customers and our business partner customers.

## Analysis and discussion

To analyze and interpret the field data (interview data), we used ATLAS.ti computer software program. In this program, we imported and coded the field data. Then for each separate case we created a network to interpret and analyze the relationship between the coded quotations in the questionnaire (see Table 2). Figs. 1, 2 and 3, show the relationships between the coded elements of the cases created with ATLAS.ti program. In these networks, rectangular boxes indicate coded quotations in field data. The arrow signs ( $\rightarrow$ ) signify the link between the quotations. The square bracket signs ( $\square$ ) signify that "is part of". The imply signs ( $\Rightarrow$ ) signify that "is cause of". For instance, in Fig. 1, project management, product design, and product development skills are part of organizational capabilities. Or, organizational capabilities are the cause of opportunity recognition; opportunity recognition and using agile method are the causes of frequent changes, which is part of organizational capabilities.

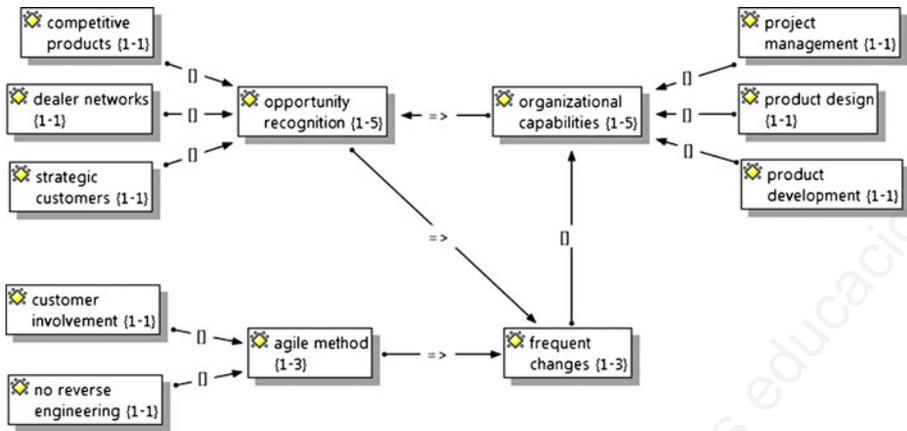


Fig. 1 ATLAS.ti Network of GlobeStar Systems Inc.

The research findings (depicted in Figs. 1, 2 and 3) show the sources and the processes of creation of dynamic capabilities in software entrepreneurial firms. Compared to substantive capabilities (or ordinary capabilities) that the firm uses for its day-to-day operations, dynamic capabilities are higher level capabilities (Winter 2003). Thus, it is difficult to capture and measure dynamic capabilities directly. In this study, however, by measuring changes in substantive capabilities, we managed to capture (measure) dynamic capabilities—as change enablers of substantive capabilities. First, by adopting different perspectives on dynamic capabilities discussed earlier (see Table 1), we identified what the firm’s substantive capabilities are. And then by capturing the changes in the firm’s substantive capabilities, we captured dynamic capabilities indirectly.

As shown in Figs. 1, 2, and 3, the major substantive capabilities (in our field studies we called them organizational capabilities) are new product design skills, new product development skills, and project management skills. In prior research on organizational capabilities in software firms, Ethiraj et al. (2005) identified two

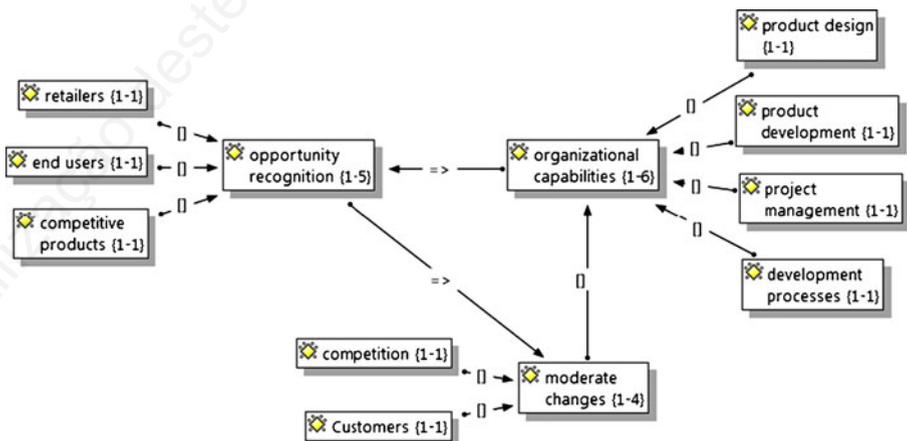


Fig. 2 ATLAS.ti Network of Arkipelago

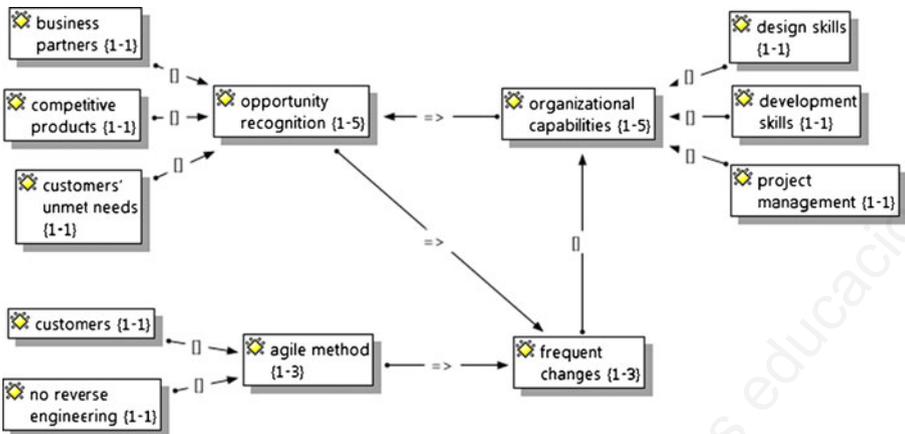


Fig. 3 ATLAS.ti Network of Information System Architect (ISA)

categories for capabilities in software firms: project management capabilities and client-specific capabilities – i.e., a function of repeated interactions with clients over time and across different projects. Case findings here also show that project management capabilities were similar and applicable to all the firms. For instance, in our interviews, companies emphasized that once they develop a set of project management skills, they can use those skills to conduct different software projects. At the same time, however, contrary to Ethiraj et al. (2005) capability categorization, these case studies show that other substantive capabilities, particularly software design and development skills, were not client-specific but rather generic and applicable to companies' different projects. This means, like project management capabilities, the companies could use these capabilities to conduct different software projects.

To measure changes in substantive capabilities we asked the firms about the frequency of changes and the sources of changes in their substantive capabilities. All the companies did modify and change their design and development skills but they did with different magnitude and in different phases of a project. In GlobeStar Systems Inc. they changed and modified their design and development skills and their project management skills throughout the entire project. Therefore, they had a high degree of dynamic capabilities—i.e., a high degree of ability to change and modify their substantive capabilities. In ISA they changed their substantive capabilities frequently but only in the beginning of each project and throughout a project they did not change their substantive capabilities. In Arkipelago, on the other hand, they changed their substantive capabilities throughout the entire project but their changes were moderate. Therefore, it had a moderate degree of dynamic capabilities.

Arkipelago competition in the market and customers' feedback were the important sources of change to their substantive capabilities. These sources had direct impact on the changes in their substantive capabilities. In GlobeStar Systems Inc. and ISA, however, customers' feedback and competition in the market had indirect impact through using agile design and development method. In these firms, competitions in the market were analyzed by looking at competitive products design and development methods, not reverse engineering their competitive products according to the firms. Besides external causes, as shown in Figs. 1 and 2, using agile methods were internal

cause of frequent changes to substance substantive capabilities. This findings support the previous theoretical discussion (see Table 1) that the causes of creation and modification of dynamic capabilities are partly endogenous but mostly exogenous to the firms' internal activities. Overall, the findings of the research show that frequent interaction with the customers was the major cause of frequent changes to the firm's substantive capabilities. In effect, customers' feedback and involvement in product design and development were one of the major sources of creation and modification of dynamic capabilities for the firms.

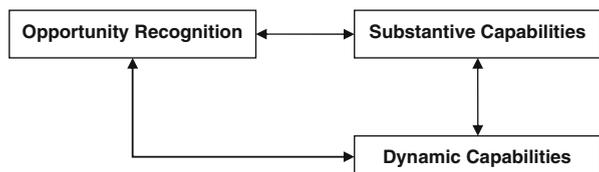
The research findings show that all the companies directly and indirectly sought opportunities in the market. However, the frequency of opportunity-seeking activities was different among the firms. For example, GoldStar Systems Inc. sought opportunities in the market more often than the other two companies. Also, GoldStar Systems Inc. sought opportunities through three different sources: dealer networks, strategic customers, and competitive products. Arkipelago, similarly, used three sources to search for opportunities: software retailers, end users, and competitive products. And Information System Architect also used three sources to seek for opportunities in the market: business partners, customers' unmet needs, and competitive products. In all cases, the firm's substantive capabilities were the causes of opportunity recognition—i.e., the stronger the firm's substantive capabilities, the stronger firm's ability to seek, and recognize opportunities in the environment.

## Conclusion

The finding of this study to a great extent supports prior studies on dynamic capabilities and entrepreneurial activities. There are several studies that have looked at dynamic capabilities in entrepreneurial firms (see, e.g., Jantunen et al. 2005; Kor et al. 2007; Newbert 2005; Zahra et al. 2006). For instance, the seminal study by Zahra et al (2006) emphasizes the relationship and interconnectivity between entrepreneurial activities, substantive capabilities, and dynamic capabilities. According to their study, entrepreneurial capabilities (such as opportunity recognition capabilities) may cause changes to dynamic capabilities but dynamic capabilities cause no changes to entrepreneurial capabilities (see Zahra et al. 2006).

As discussed before, the findings of this study also supports the relationship and interconnectivity between entrepreneurial and dynamic capabilities. However, the findings of this study do not support the unidirectional-causal relationship between dynamic and entrepreneurial capabilities—i.e., only entrepreneurial capabilities cause changes to dynamic capabilities, not vice versa. In contrast, the findings of this study show that dynamic capabilities have a bidirectional-causal relationship with entrepreneurial capabilities—i.e., the development of dynamic capabilities leads to the

**Fig. 4** The relationship between opportunity recognition and dynamic capabilities



development of entrepreneurial capabilities—and vice versa, the development of entrepreneurial capabilities leads to the development of dynamic capabilities (see, e.g., Figs. 1, 2, and 3). For instance, the companies in our case study emphasized that over time, they have learned to use agile design and development method. This method enables them to leverage the opportunities in the market by changing and modifying their design and development skills. At the same time, leveraging opportunities in the market enables them to change and modify their substantive capabilities that lead to stronger dynamic capabilities. Therefore, as shown in Fig. 4, we can conclude that opportunity recognition capabilities (entrepreneurial capabilities) and dynamic capabilities have a circular and iterative (or spiral) relationship with each other—i.e., each reinforces the other. The more often this iteration takes place, the stronger opportunity recognition capabilities and dynamic capabilities are.

### Limitation of the study and need for further research

Although this study has reached its aims, however, due to the limited number of cases, generalization of its findings is premature. Therefore, building on the findings of these case studies, an additional survey research, a quantitative research, is needed to generalize the findings of this study.

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**Interviews** Mr. Jason Wilson, Vice President of Research and Development, GlobeStar Systems Inc., Toronto, Canada, August 3, 2006.

Mr. Timothy O'Hara, the Founder and CEO, Arkipelago, Toronto, Canada, August 4, 2006.

Mr. Val Serebryanny, Vice President of Professional Services, Information System Architect (ISA), Toronto, Canada, August 5, 2006.

### References

- Ashby WR (1956) An introduction to cybernetics. Chapman Hall, London
- Barney J (1991) Firm resources and sustained competitive advantage. *J Manage* 17:99–120
- Baron RA, Shane SA (2008) Entrepreneurship: a process perspective. South Western Cengage Learning, Mason
- Beck K et al. (2001) Manifesto for Agile Software Development. Agile Alliance: <http://agilemanifesto.org/>. Retrieved 2010-06-14
- Clark KB, Fujimoto T (1991) Product development performance: strategy, organization, and management in the world auto industry. Harvard Business School Press, Boston
- Dougherty D (1992) Interpretive barriers to successful product innovation in large firms. *Organ Sci* 3:179–202
- Eisenhardt KM (1989) Building theory from case study research. *Acad Manage Rev* 14(4):532–550
- Eisenhardt KM, Graebner ME (2007) Theory building from cases: opportunities and challenges. *Acad Manag J* 50(1):25–32
- Eisenhardt KM, Martin J (2000) Dynamic capabilities: what are they? *Strateg Manag J Spec Issue* 21(10–11):1105–1121
- Eisenhardt KM, Schoonhoven CB (1996) Resource-based view of strategic alliance formation: strategic and social effects in entrepreneurial firms. *Organ Sci* 7(2):136–150

- Ethiraj et al (2005) Where do capabilities come from and how do they matter? A study in the software services industry. *Strateg Manag J* 26:25–45
- Fredrickson JW (1984) The comprehensiveness of strategic decision processes: extension, observations, future directions. *Acad Manage J* 27:445–466
- Gartner WB (1985) A conceptual framework for describing the phenomenon of new venture creation. *Acad Manag Rev* 10(4):696–706
- Hayek FA (1978) Competition as a discovery procedure. *New studies in philosophy, politics, economics and the history of ideas*. University of Chicago Press, Chicago, pp 179–190, F. A. v. Hayek
- Helfat CE, Raubitschek RS (2000) Product sequencing: co-evolution of knowledge, capabilities and products. *Strateg Manag J* 21:961–979
- Jantunen A, Puumalainen K, Saarenketo S (2005) Entrepreneurial orientation, dynamic capabilities and international performance. *J Int Entrep* 3(3):223–243
- Judge WQ, Miller A (1991) Antecedents and outcomes of decision speed in different environmental contexts. *Acad Manage J* 34:449–463
- Katkalo VS, Pitelis CN, Teece DJ (2010) On the nature and scope of dynamic capabilities. *Ind Corp Chang* 19(4):1175–1186
- Kirzner I (1997) Entrepreneurial discovery and the competitive market process: an Austrian approach. *J Econ Lit* 35(1):60–85
- Kor YY, Mahoney JT, Michael SC (2007) Resources, capabilities and entrepreneurial perceptions. *J Manag Stud* 44(7):1187–1212
- Kraaijenbrink J, Spencer JC, Groen AJ (2010) The resource-based view: a review and assessment. *J Manag* 36(1):349–372
- Larson A (1992) Network dyads in entrepreneurial settings: a study of the governance of exchange relationships. *Adm Sci Q* 37(1):76–105
- Mathiassen L, Vainio AM (2007) Dynamic capabilities in small software firms: a sense-and-respond approach. *IEEE Trans Eng Manag* 54(3):522–538
- McKelvey B (2004) Toward a complexity science of entrepreneurship. *J Bus Venturing* 19:313–341
- Mises LV (1949) *Human action*. Yale University Press, New Haven
- Newbert SL (2005) New firm formation: a dynamic capability perspective. *J Small Bus Manag* 43(1):55–77
- Porter ME (1985) *Competitive strategy*. The Free Press, New York
- Rumelt RP, Schendel D, Teece DJ (1991) Strategic management and economics. *Strateg Manag J*, Special Winter Issue 12:5–29
- Shane S (2000) The promise of entrepreneurship as a field of research. *Acad Manag Rev* 25(1):217–226
- Stevenson HH, Harmeling S (1990) Entrepreneurial management's need for a more 'chaotic' theory. *J Bus Ventur* 5:1–14
- Stevenson HH, Jarillo JC (1990) A paradigm of entrepreneurship: entrepreneurial management. *Strateg Manag J* 11(4):17–2
- Teece DJ (2007) Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance. *Strateg Manag J* 28:1319–1350
- Teece DJ, Pisano G, Shuen A (1997) Dynamic capabilities and strategic management. *Strateg Manag J* 18(7):509–533
- van Stel A, Carree M, Thurik R (2005) The effect of entrepreneurial activity on national economic growth. *Small Bus Econ* 24(3):311–321
- Venkataraman S (1997) The distinctive domain of entrepreneurship research: an editor's perspective. *Adv Entrep Firm Emerg Growth* 3:119–138
- Wernerfelt B (1984) A resource-based view of the firm. *Strateg Manag J* 5(2):171–180
- Wheeler BC (2002) NEBIC: a dynamic capabilities theory for assessing net-enablement. *Inform Syst Res* 13(2):125–146
- Winter SG (2000) The satisfying principle in capability learning. *Strateg Manag J* 21(10/11):981–996
- Winter SG (2003) Understanding dynamic capabilities. *Strateg Manag J* 24(10):991–995
- Yin RK (2003) *Case study research: design and methods* (3rd edn). SAGE Publications, Thousand Oaks, CA
- Zahra SA, Sapienza HJ, Davidsson P (2006) Entrepreneurship and dynamic capabilities: a review, model and research agenda. *J Manag Stud* 43(4):917–955
- Zollo M, Winter SG (2002) Deliberate learning and the evolution of dynamic capabilities. *Org Sci* May Jun 13(3):339–351