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Dynamic capabilities in young entrepreneurial ventures: evidence from Europe

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Abstract

The concept of dynamic capabilities (DCs) and their role in firm strategy, value creation and competitive advantage have attracted a great deal of interest among scholars. Few studies have explicitly explored which types of firms are more likely to benefit from dynamic capabilities. The relevant literature has mainly focused on established companies while limited attention has been given to young firms. In addition, more research is required to determine the relevance of dynamic capabilities in diverse environmental settings. This paper empirically investigates the link between dynamic capabilities and various performance measures using survey data of young European firms. In doing so it examines the efficacy of DCs a) in young firms and b) in different industrial settings. Our findings suggest that, in general, dynamic capabilities have a positive relationship with new firms' growth, international sales, and innovative performance and that they can be of value in both high-tech and low-tech sectors.

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1. Introduction

Dynamic capabilities and their role in firm strategy, value creation and competitive advantage have attracted a great deal of interest among scholars. Since the concept of DCs was first introduced by Teece et al. (1997) an impressive body of work has refined and expanded the original idea. However, do we yet have a "theory" of DCs? Bounding assumptions are critical to specify as they establish the limitations in applying a theory. Although most research related to DCs has not paid due attention to bounding assumptions there are two ongoing debates regarding specific boundary conditions that deserve mentioning: those associated to (a) types of firms and (b) environmental conditions.

Few studies have explicitly explored which types of firms are more likely to benefit from dynamic capabilities. The relevant literature has mainly focused on established companies while scant attention has been given to young firms as they shape, discover and exploit opportunities. In particular, bigger and older enterprises are generally thought as more eligible for the study of dynamic capabilities because it is assumed that their size and age ensure an adequate organizational structure and the required resources to develop and exercise dynamic routines. So far, the limited but gradually increasing research on DCs

regarding newly founded firms indicates that new ventures need dynamic capabilities to expand their limited set of resources and/or to reconfigure their resources in order to survive, grow and thus enhance the potential for innovative entrepreneurial activity (e.g. McKelvie and Davidsson, 2009; Arthurs and Busenitz 2006; Arend, 2014). This growing interest imposes the need for more empirical research to address the relevance of dynamic capabilities in small young firms.

A second category of boundary assumptions relates to the environmental conditions under which DCs can apply. There is a significant variation in the literature regarding the kind of external business environments that are relevant for dynamic capabilities, i.e. researchers have not reached yet a consensus on the role and usefulness of dynamic capabilities in environments of varying degrees of dynamism (Zahra et al., 2006; Barreto, 2010). There are those who clearly suggest that the nature of DCs is synonymous to highly dynamic environments (e.g. Teece et al., 1997), those who acknowledge the applicability of the concept not only in rapidly changing environments (e.g. Eisenhardt and Martin, 2000; Helfat et al., 2007; e.g. Helfat and Winter, 2011) but also in environments subject to lower rates of change and those who simply decide not to include specific environmental characteristics in their line of argument (e.g. Makadok, 2001).

Thus more research is required to determine the relevance of dynamic capabilities in diverse environmental settings. Empirical studies should explicitly compare the effects of similar DCs in two or more clearly distinct environments such as different industries (Barreto, 2010). However, DCs have been primarily studied in high-technology industries, since these contexts are considered turbulent enough to drive the development – and consequently justify the cost – of specific dynamic capabilities. Despite the fact that an increasing number of scholars see an important role for DCs also in moderately dynamic environments, there is limited evidence of the dynamic capabilities' role in low-tech industries which, compared to their high-tech counterparts, are typically considered as relatively more stable contexts.

This paper empirically investigates the link between DCs and various performance measures and examines the efficacy of dynamic capabilities a) in young firms and, b) in different industrial settings. The empirical work unfolds in three stages. First, we have tried to develop a set of DCs constructs that can be of value to young firms. Theoretical and empirical research on DCs in new firms provides inconclusive results concerning the DCs underlying processes in such contexts. It is clear that the effort here is not designed to be comprehensive, but to provide an initial framework emphasizing key capabilities that can be empirically tested in young entrepreneurial ventures. We identified four dynamic capabilities processes: a) sensing capability which includes market and technology adaptation dimensions, b) product

development capability which can be understood as a proxy for seizing opportunities, c) networking capability and d) participation in technology collaborations.

Second, we have tried to empirically assess the applicability of the aforementioned DCs in a large sample of young firms operating in various industrial sectors (high-tech manufacturing, low-tech manufacturing and knowledge-intensive business services) by examining their impact on diverse performance indicators. Data were collected through a large-scale telephone survey in ten European countries using a structured questionnaire in the native languages. Our findings suggest that, in general, dynamic capabilities have a positive relationship with new firms' growth, international sales, and innovative performance.

Third, taking into consideration that DCs can be important both in rapidly changing and relatively more stable environments we examined the relationship between DCs and various performance measures in different industrial contexts by splitting our sample in two distinct sectoral groups i.e. high-tech vs. low-tech young companies. Our findings suggest that dynamic capabilities can be of value in both settings, however, the significance of specific dynamic capabilities appears to differ between the two contexts underlining the importance of taking into consideration the degree of environmental dynamism when making claims about performance implications of DCs.

The chapter begins with a theoretical discussion on the role of dynamic capabilities in newly established firms, their applicability under diverse environmental conditions focusing on high and low-tech sectors, and their impact on new ventures growth and performance. In the third section we present the research design, introduce the experimental setting and measures used paying special attention on the dynamic capabilities processes. We then document the empirical results and discuss major findings. The paper ends with our concluding remarks.

2. Theoretical discussion

2.1 Can dynamic capabilities be present in young entrepreneurial ventures?

In this paper we argue that dynamic capabilities may exist/can be present in young firms suggesting that a new venture able to invest and use DCs is more likely to identify, exploit and defend profitable opportunities.

However, there are scholars who clearly put forward that young firms do not have dynamic capabilities. Teece and Pisano (1994) explicitly argue that dynamic capabilities take years to be developed and thus new ventures cannot meet this requirement by definition. Helfat and Peteraf (2003) claim that "a new

organization has no dynamic capabilities" (p. 1004) because of the assumed lack of long-term motivation and the necessary resources to support their creation and subsequent development. Young firms are generally small in size and therefore are less likely to meet the scale needed to justify dynamic capabilities. This practically means that it might be preferable for them to focus on the short-term in order to address their liabilities of newness and smallness rather than to invest in building routinized change processes that usually imply high initial investment.

Nevertheless, literature also suggests that dynamic capabilities can be present both in young and established firms. Helfat et *al*. (2007) highlight that creating, adapting to, and exploiting changes in the business environment is an inherently entrepreneurial activity (not implying of course a lack in strategy and organization), for *large* firms and *small*, for *established* firms and *new* ones. However, they point out that almost by definition new ventures "typically develop fewer patterned forms of behaviour that underpin a capability" (p. 6) compared to older companies.

Furthermore, Teece (2007) points out that the dynamic capabilities framework goes beyond traditional approaches in terms of understanding competitive advantage in that it does not only stress the characteristics and processes needed to achieve superior positioning in a munificent ecosystem, but it also attempts to elucidate new strategic considerations and the decision-making disciplines required to ensure that opportunities, once *sensed*, can actually be *seized* and how the firm's resources can be *reconfigured* as soon as the market and/or the technology changes. An important point in this last Teece's article on the microfoundations of DCs is that maintaining dynamic capabilities requires 'entrepreneurial management'. Entrepreneurial management has little to do with analyzing and optimizing but it is more about sensing and seizing and addressing the next promising technological opportunity while staying in alignment with customer needs. In conclusion, the implicit thesis advanced by Teece it that in both *large* and *small* firms, entrepreneurial management is a necessary prerequisite to sustain financial success. He also advocates that the entrepreneurial management function embedded in dynamic capabilities applies both to *start-up* activities and established firms.

These two contributions connect the DCs concept with entrepreneurial management suggesting that these capabilities can be present both in young and established firms. This is particularly important if we take into account that the literature on dynamic capabilities has given limited attention to younger firms focusing mainly on large and established enterprises (McKelvie and Davidsson, 2009; Zahra et al, 2006). However, researchers have recently begun to explore the birth and evolution of new ventures' dynamic capabilities (e.g., Arthurs & Busenitz, 2006; Zahra & Filatotchev, 2004) indicating that entrepreneurial

ventures and their managers should identify their weaknesses and emerging problems and constantly hone and reconfigure their resources and capabilities accordingly or they will likely find themselves in a death spiral. For example, as a part of a venture's planning process specific markets may be targeted to the new products the young firm is offering. However, it is quite possible that the primary targeted market may not correspond as expected. In this case new market segments should be pursued and perhaps emerging market possibilities should be explored. Consequently, adjustments to a firm's resource base are necessary to accommodate such changes (Arthurs and Busenitz, 2006).

In addition, McKelvie and Davidsson (2009) show that whereas new firms may well get successfully started with extremely limited resources, their development and continued growth is contingent on the existence of dynamic capabilities to further extent and develop the existing resource endowments. For example, when a young firm experiences rapid growth, it faces the challenge of how to reconfigure its internal processes in order to achieve effective functional specialization and organizational integration (Zahra et al. 2006).

Zahra et al. (2006) suggest that dynamic capabilities exhibit different attributes and are developed, used and updated in different ways in young companies compared to the older ones. In particular they propose that firms start with simple processes which become more complex as firms grow and add to their initially little knowledge or resources. Furthermore, they put forward that at an early age it is more likely that a firm's choice for developing and using dynamic capabilities is based on improvisation and trial-and error learning. In this line of argument Boccardelli and Magnusson (2006) advocate that early-stage dynamic capabilities reveal themselves as bricolage, that is, the capacity to re-interpret and re-combine already existing resources and thereby improve their fit with the demands of the market environment. Arthurs and Busenitz (2006) distinguish between entrepreneurial and dynamic capabilities arguing that the former are related to opportunity identification and the collection of required resources to pursue this opportunity during the firm's start up phase. However, as the new venture advances, "the need for dynamic capabilities becomes apparent as oganizational adjustments to its resource base and changes in the broader environment come into play" Arthurs and Busenitz (2006) (p. 200). Dynamic capabilities do not replace entrepreneurial ones but they rather act as complements to the earlier foundation.

In conclusion, there is a growing interest among scholars related to the role of dynamic capabilities in the context of new entrepreneurial ventures. The main logic behind their arguments is that "what an entrepreneur does is what a DC is". In theory, an entrepreneur redeploys accessible resources to create and/or exploit new opportunities and this redeployment is a dynamic capability in itself. (Arend, 2014),

i.e. what is entrepreneurial is closely in line with what is to have a dynamic capability. Thus, young firms with DCs are more likely to expand their limited set of resources and/or to reconfigure their resources in order to adapt to technology changes, uncertain markets, and better resourced rivals or even to internal organizational changes.

2.2 Are dynamic capabilities relevant to low-tech sectors?

Several scholars (e.g. Teece et al., 1997; Teece, 2007) explicate the meaning of dynamic capabilities and their importance for achieving competitive advantage in rapidly changing environments. In a dynamic business context the potential value of dynamic capabilities lies in enabling firms to renew and reconfigure their resources in order to better fit to shifting environmental conditions. However, frequent use of dynamic capabilities can also be justified in moderately changing environmental contexts (e.g. Eisenhardt and Martin, 2000; Helfat et al., 2007; Helfat and Peteraf, 2009).

In a relatively stable environment, although external changes occur they are to a large extent predictable and incremental and the rate of change is lower, compared to that experienced by firms operating in more dynamic environmental contexts. Nevertheless, in spite the lower level and intensity of changes, there would still be some need to adapt or continuously improve the existing resource base in order that resources maintain their value. This suggests that dynamic capabilities do not only have a role in rapidly changing environments but they can also be of value in less dynamic contexts by exploiting existing knowledge to effect incremental change (Protogerou et al., 2012). Additionally, Helfat and Peteraf (2009) advocate that not all fast-paced environments are characterized by regular disruptive change suggesting that some of them are better marked by continuous, incremental shifts. In such contexts dynamic capabilities may be critically important. Furthermore, dynamic capabilities have the potential to advance ongoing adaptation rendering disruptive change less essential (O'Reilly and Tushman, 2007).

According to Miller and Friesen (1983) both volatility (rate and amount of change) and unpredictability (uncertainty) can be considered as fundamental elements of environmental dynamism. Business environments can be dynamic in many different ways (Duncan, 1972; Dess and Beard, 1984). For example, changes in the industry structure, the instability of market demand, the intensity of competition or the likelihood of environmental shocks are important dimensions of environmental dynamism.

It is quite evident that to date researchers have not managed to provide a compelling explanation of the role of dynamic capabilities under conditions of various levels of environmental dynamism and especially in contexts considered as less dynamic such as the so-called mature or low-tech industries. These industries are usually acknowledged as less dynamic and agile than high-tech ones. They are characterized

by “remarkable stability” due to “stagnant demand for low-tech products, or ….(due to) declining international competitiveness and import penetration” (Kaloudis et al. (2005), p. 28). They are also assumed to spend rather insignificant amounts for R&D resulting in slow-paced changes. However the new millennium seems to have brought certain changes to such established views. The so-called mature industries do not enjoy a stable and well-protected environment any more. Therefore, *“while high-tech sectors may have greater innate capacity to spawn product innovations, LMT industries may be faced with a greater necessity to do so.”* (von Tunzelmann and Acha, 2005, pg. 415).

In addition, which business environment can be characterized as stable nowadays? Helfat and Peteraf (2009) argue that the oil industry, which is normally classified as a low-medium tech (LMT) sector (following OECD’s guidelines), is far from “stable”, since it “*has endured large price swings and several rounds of consolidation since the mid-1970s*”. Teece (2010) suggests that rapid change is a condition that currently prevails in a growing number of industries. This is because “*the global economy has undergone drastic changes that have accelerated the rhythm at which firms innovate. The decreased cost of communication and data flow, the reduced barriers to trade, and the liberalization of labour and financial markets in many parts of the world are forcing firms to confront agile and/or low-cost competitors early in the product cycle…*” (pg. 694). Therefore, it could be assumed that the prevailing views regarding the “stagnancy” and relevant “stability” of low-tech sectors may also be challenged in recent years. Thus, although not dynamic by definition (Sciascia et al. 2009), low-tech traditional industries are nowadays characterized by environmental hostility and are also subject to major changes. Globalization and trade liberalization have raised interesting new problems and significant challenges for them, delineating a vulnerable, volatile and rapidly changing environment. Mature industries can even create environmental dynamism through cumulative knowledge which can provide options to expand to new markets and businesses (Penrose, 1959; Wall et al., 2010), since this is the only way to survive.

Therefore, we can assume that dynamic capabilities can indeed play a role in more mature, traditional industries. This is because dynamic capabilities can be useful even in less turbulent environments. Under these circumstances dynamic capabilities do not essentially transform the firm’s resource base but mainly support its adaptive change through incremental improvements. Admittedly, when an environmental context is perfectly stable the potential of dynamic capabilities might be limited because there are few occasions to exercise them effectively, in particular when considering the costs related to their development. However, as literature review reveals, low-tech industries are far more dynamic than usually believed as they have to confront the instability of global markets, the fast pace of inter-sectoral technological advances and the high probability of environmental shocks, i.e. major elements of

environmental dynamism. Thus, the need to change the firm's resource base can also occur in low-tech sectors (Teece, 2010).

2.3 Do dynamic capabilities relate to young firms' organizational performance?

One of the most important issues in entrepreneurship concerns processes associated with firm survival and growth. A relatively small but increasing body of empirical research focuses on the way dynamic capabilities relate to the performance, survival and growth of new firms (e.g. Arthurs & Busenitz, 2006; Zahra & Filatotchev, 2004; Stam et al, 2007; Stam and Wennberg, 2009; McKelvie and Davidsson 2009; Grande, 2011), while in their grand majority involve high-tech sectors. For example, Stam et *al.* (2007) examined the impact of dynamic capabilities on high-tech start-ups' growth, resulting to initial R&D activities and inter-firm alliances as the dynamic capabilities most likely to accompany growth. The authors noted that in newly-established firms, attempts to sustain and renew capabilities do not at first take the form of routines, but of trial and error efforts, for instance at R&D and alliances. Boccardelli and Magnusson (2006) use the dynamic capabilities framework of strategy trying to investigate how firms go about to match their resource bases with opportunities in the marketplace in the Swedish mobile Internet industry. They suggest the single entrepreneur as a source of dynamic capabilities, arguing that "dynamic capabilities can exist already at the outset of a venture, then however residing primarily in the few individuals constituting the entrepreneurial team and not always throughout the organization".

Research also suggests that dynamic capabilities are important for the evolution and successful entry and survival of new firms especially in international markets (Sapienza et *al.*, 2006; Jantunen et *al.,* 2005). Zahra et *al.* (2006) adds that the skills and competencies that "these firms have, must be upgraded and new dynamic capabilities must be built to ensure successful adaptation for growth".

Some researchers also address questions on the existence and importance of dynamic capabilities for the creation and evolution of new ventures. Newbert (2005), for example, based on a study of 817 US nascent entrepreneurs, sees firm formation process as a dynamic capability, defined as the "organizational and strategic routines by which firms achieve new resource combinations".

It's also worth mentioning that a new research stream tries to explore dynamic capabilities within the crisis *extreme* high-velocity environment (Piva et *al*., 2012; Simon, 2010) which can have a major impact on both high and low-tech sectors.

Although dynamic capabilities can play a role in more mature, traditional industries there is limited empirical research on the dynamic capabilities' existence and role in low-tech firms either in their start-

up stage or later on in their lifetime. Helfat (1997) was perhaps one of the first scholars to engage a medium-tech industry in her research and confirm R&D as a dynamic capability in the U.S. petroleum industry. Since then a stream of empirical research has been slowly emerging trying to capture the impact of dynamic capabilities in LMT sectors. These research efforts, both qualitative and quantitative, address several issues such as the relationship between dynamic capabilities and firm performance, the role of DCs in achieving competitive advantage at the international level and their impact on innovative performance and change capability (Abro et al. (2011); Chirico (2007); Grande (2011); Salvato (2003); Borch and Madsen (2007); Telussa et al. (2006). In addition, other studies explain how dynamic capabilities are actually developed and manifested in medium and low-tech industries mostly in cases of internationalization (Evers, 2011; Kuuluvainen, 2011; Quentier, 2011).

In conclusion, despite the substantial body of work on dynamic capabilities, the DCs approach has so far been developed and empirically grounded mainly in highly dynamic contexts (especially in high-tech manufacturing) using as a unit of analysis large, established firms.

It is evident that further research of dynamic capabilities in young SMEs and micro firms is necessary and of great importance especially nowadays, since the pressures of increasing globalization and rapid technological and socioeconomic changes have major impacts on small and medium-sized entrepreneurial ventures, arising quite different issues than those of interest to large organizations. Consequently, the need of establishing theoretically and empirically sound recommendations and policies on the creation and sustainment of strong competitive advantages is vital for the vast majority of the European business ecosystem.

3. Methodology

3.1 Research design

So far, the limited but gradually increasing research on DCs regarding newly founded firms is evident through a number of empirical studies, which indicate that new ventures need dynamic capabilities in order to survive, grow and thus enhance the potential for innovative entrepreneurial activity. This growing interest imposes the need for more empirical research to address the issue of the creation and importance of dynamic capabilities for the creation and evolution of new ventures.

First we have tried to develop a set of dynamic capabilities constructs that can be of value to young firms. The starting point of this attempt was Teece's (2007) recent work on dynamic capabilities, in which three processes are stressed: the capability of organizations and entrepreneurs to sense new opportunities and threats in the business environment, the capability to address the once sensed new opportunities through new products, processes ore services, and the ability to recombine and reconfigure resources as the enterprise grows and the markets and technologies change. Having these core processes as a guide we proceeded in a literature review to search for similar processes and also to examine the need for including additional ones or dropping any of them. The next step was to reconcile the different labels and meanings of the processes found in the literature and to create distinctive categories that would best reflect both the original conceptualization advanced by Teece (2007) and our own understanding of the literature. As already mentioned the empirical and theoretical research on dynamic capabilities in new firms is quite limited and provides inconclusive results concerning the DCs underlying processes in such contexts. It is clear that the effort here is not designed to be comprehensive, but to provide an initial framework emphasizing key capabilities that can be empirically tested in the context of young entrepreneurial ventures. We identified four dynamic capabilities processes: a) sensing capability which includes market and technology adaptation dimensions, b) product development capability which can be understood as a proxy for seizing opportunities, c) networking capability and d) participation in technology collaborations. The last two processes can be thought of as significant drivers for reaching and integrating technology, market and other types of knowledge which are developed outside their boundaries. In this way, various networking activities can support sensing opportunities but can also help firms build learning and knowledge-sharing procedures that are likely to be critical to business performance and a key foundation of dynamic capabilities (Teece, 2007).

Second, we have tried to empirically assess the applicability of the dynamic capabilities concept using the aforementioned processes in a large sample of young entrepreneurial ventures operating in various industrial sectors and in ten different European countries by examining their impact on growth, international sales and innovative performance.

Third, taking into consideration that: a) dynamic capabilities can be important both in rapidly changing and more stable environments and, b) that young entrepreneurial ventures are in a continuous need to recombine and transform their market and technology knowledge in order to address changing business contexts, we examined the applicability of DCs under two distinct environmental settings: high-tech and low-tech sectors.

3.2 The sample

The quantitative analysis data originate in the AEGIS[1] project survey. The survey was launched between fall 2010 and spring 2011 in an attempt to indentify motives, characteristics and patterns in the creation and growth of young firms which are based on the intensive use of knowledge and are operating in three broad sectoral groups: high-tech manufacturing, low-tech manufacturing and knowledge intensive business services. All firms were founded between 2001 and 2007 they have managed to exceed the critical three-year survival threshold, and were established in ten European countries: Croatia, Czech Republic, Denmark, France, Germany, Greece, Italy, Portugal, Sweden, and UK**.**

In order to interview actually newly-established firms the survey instrument included a set of screening questions to detect a) firms that were just new legal entities resulting from legal transformation of already existing firms, b) subsidiaries of existing companies, c) mergers, acquisitions, or joint ventures. These firms were characterized as non-eligible for the survey.

The primary data source for the survey population was the Amadeus Database. However additional data sources were used (Kompass, D&B) as during the interview process (screening questions) it was found out that a large number of firms recorded as new were not so. An initial sample of 23,405 firms was randomly drawn from the entire population of firms as available at the abovementioned databases. Among them 10,581 were judged as not eligible for the survey during the screening part of the questionnaire mostly because they were not actually new entities. The final sample of eligible firms was 12,824 firms and approximately 4,000 of them accepted to respond to the questionnaire, thus the survey obtained an average response rate of 31.2% across countries. All respondents, usually one of the firm founders, were contacted by telephone and completed the questionnaire online in their local language under the tutelage of expert interviewers.

For the purpose of our analysis the sample of firms which was drawn from the AEGIS dataset includes 2,218 enterprises that belong either to high-tech and low-tech manufacturing or high-tech knowledge intensive business services (e.g. internet/telecom operators, programming activities, IT consultants). In this way we have also created two comparable subsamples in terms of size and characteristics i.e. two distinct sectoral groups (high and low-tech) that would allow us to test in the best possible way our research questions (see Table 1).

[1] EU funded research project "Advancing Knowledge-Intensive Entrepreneurship and Innovation for Economic Growth and Social Well-Being in Europe" (AEGIS), 7th Framework Programme for Research and Technological Development, European Commission

The sample firms are independent young entities with an average age of 7 years. The majority of them (64%) are micro firms i.e. they employ up to 9 full-time persons. 96.4% can be qualified as small firms because they employ less than 50 people. Thus our sample consists of micro and small firms. These companies usually exhibit little ability or will to grow and are typically in less disadvantaged position in their respective fields in terms of market positioning and access to resources.

Table 1: Sector distribution of firm sample

Sectoral groups	# of firms	% of firms
High-tech manufacturing	87	3.9
Medium-high-tech manufacturing	331	14.9
High-tech knowledge-intensive services	617	27.8
High-tech sectoral groups	***1035***	***(46.6)***
Low-medium-tech manufacturing	283	12.8
Low-tech manufacturing	901	40.6
Low-tech sectoral groups	***1184***	***(53.4)***
Total	2219	100

3.3 The variables

The variables used to capture *dynamic capabilities* were: market and technology sensing capability, new product development capability, networking capability and capability to participate in technology collaborations. Each of them was measured with specific items. Firm founders were asked to indicate in a five-point Likert type scale the extent to which the particular capabilities have been developed in their firms.

Sensing capability (market and technology adaptation)

Following Teece's (2007) terminology, sensing capabilities denote the firm's activities in scanning and monitoring changes in operating environments and identifying new opportunities. Sensing is an inherently entrepreneurial set of capabilities that involves exploring market and technological opportunities, probing markets, and listening to customers.

Market sensing, i.e. the capability to sense new market opportunities, involves understanding and responding to market intelligence (Pavlou and El Sawy, 2011) by observing, counteracting and capturing related opportunities. More specifically, customer feedback and processes of market-shift recognition are

used to identify new market segments and changing customer needs. In addition, market observation and collection of information and knowledge on competitive moves, outstanding products, novel promotion methods and other relevant best practices is imperative in order to detect, interpret new opportunities and effectuate change as required.

However, sensing entails also processes to acquire knowledge about, and understand technology developments in the business environment. An organization that has a high level of technology sensing capability will continually scan for information about potential technological opportunities and threats (Srinivasan et al., 2002) and respond to technological changes in its environment. Organizations develop systems and infrastructure such as formal technical and engineering departments to select and understand new technologies, and direct internal R&D. R&D activities can be thought of as a form of 'search' for new products and processes (Teece, 2007). Yet, technical adaptation extends to a blending of research and development activities with design and market oriented dimension needed to proceed with seizing and communication of products/services to markets.

In our research market sensing was captured by employing items reflecting adaptation to best practices, response to competitive moves, and customer feedback, recognition of shifts in markets, consideration of the consequences of changing market demand and capturing of new opportunities. Technology sensing was measured using three items, namely the existence of formal R&D and technical departments and the frequent exchange of practical experience among employees.

New product development capability

New product development is considered to be a key source of competitive advantage and a strategic function of the organization which constitutes a major requirement for success (Teece, 2007). In today's competitive environment, firms have to cover latent needs, find new markets for novel products and diversify their markets adapting to specific needs of different customers.

New product development capability is commonly defined as organizational processes that purposefully change the firm's product portfolio. It is generally assumed that such routines lead to new product innovations that in turn result in competitive advantage (Danneels, 2008; Schilke, 2014). Several authors suggest that new product development is a prototypical dynamic capability and argue that innovation is the cornerstone of DCs (e.g. Iansiti and Clark, 2004; Dosi, Nelson and Winter, 2000; Eisenhardt and Martin, 2000; Helfat, 1997, Helfat et al. 2007, Helfat and Winter, 2011).

New product development can be considered as an important dynamic capability not only for established firms but also for young ones (e.g. Piva et al., 2012; McKelvie and Davidsson, 2009; Evers, 2011). In industries populated by entrepreneurial high technology firms, the rapid development of new products is

a key factor of success. In dynamic environments young firms have to rely on a portfolio of new products to compete and survive. Developing a steady stream of innovative products is necessary to gain early cash flows, to enhance external visibility, attain early market share, and to increase likelihood of survival (Deeds et al., 2000). However, the development of new products can be critical to firms' competitive advantage in low-tech sectors as well. These industries are typically challenged more by globalization and their products can be easily imitable to a large extent (Hirshch-Kreinsen, 2008). In this context competitive and cost pressure forces firms to reflect on their established practices, identify new market segments and stimulate customer demand through introducing new or upgraded products (von Tunzelmann and Acha, 2005). The capability of young low-tech firms to develop and renew their product portfolios either by extending their product lines or by adding new ones also enables their international market growth through their expansion or penetration to new foreign markets (Evers, 2011).

Altogether, a new product development capability enables firms to better satisfy existing and potential customers' current and future needs, to better serve these needs and create new market niches as well as new business ecosystems. New product development was measured with three items, namely: capability to offer novel products, capacity to adapt the products to the specific needs of different customers and market niches, and capability to actively promote and market the developed products/services.

Networking capability

Networking refers to the formation of mutually beneficial personal or business relationships to expand and accelerate the acquisition of useful resources and skills. These resources include the exchange of information and knowledge, as well as the discovery and control of opportunities and it is also extended to various types of financial and institutional support.

Enterprises search not only the core but also the periphery of their business ecosystems by embracing potential collaborators which can be customers, suppliers, and producers of complementary products or even competitors. Both in high and low-tech sectors, firms recognize opportunities for profitable exchanges of knowledge and technology, identify the relevant knowledge sources or partners (Birkinshaw et al., 2007; Carlsson et al., 2009), and develop different network types in order to sense market and technology opportunities. Networking can therefore be considered as a necessary (though not sufficient) condition for the existence of a sensing dynamic capability.

Knowledge acquisition, through networking, is positively related to new product development, technological distinctiveness, and sales cost efficiency (Yli-Renko et al., 2001). Furthermore, networking

enhances the capturing of novel technologies and production methods, the access to skilled human capital, and supports innovativeness.

Networking is shown to influence the viability and development paths of new firms (Stam and Wennberg, 2009; Yli –Renko et al., 2001; O' Gorman and Evers, 2011). Networks have been found important for firms to create competitive advantages (Dahl and Pedersen, 2004; Littunen, 2000). Common goals are shared by network members regarding markets, market shifts and customer needs, for example information sharing including competitor activities as well, and the establishment of best practice techniques in advertising and promotion. Nevertheless, incentives for participating in networks can also be of economic nature such as financial assistance in loans or fund seeking or can start from the idea of "safety", whereby associated firms are able to reduce uncertainty resulting from legal and other institutional issues related to new markets and access of new distribution channels or even export potential.

To operationalize the different underlying dimensions of networking capability we first used items related to market processes such as collecting information about competitors, accessing distribution channels, exploring export opportunities, advertising and promotion. To capture the technology side of the networking capability we employed variables assessing the network's impact on the development of new products/services, the management of production and operations, as well as the easy access to skilled personnel. Finally in order to grasp the economic and more generic value of networking we used variables assessing networks' assistance in obtaining business loans and attracting funds or providing support on legal issues.

Participation in technology collaborative agreements

Collaborations assist firms to use efficient and cost effective ways to access additional or complementary resources that can speed up progress and advance set targets. Firms develop various types of collaborations depending on the expected benefits: share the costs of R&D development, introduce new products in global markets, minimize costs, develop sales or gain access to rare or expensive resources.

A frequent type of collaboration which has gained considerable attention is strategic alliances. A review of the literature reveals a list of benefits derived by strategic alliances, such as enhancement of market power (Kogut, 1991) and access to new, rare or critical resources, skills and capabilities (Rothaermel and Boeker, 2008).

Especially R&D and technical cooperation agreements have become a strategically important part of business decision making in many industries in recent years in both high and low tech sectors. They include

any agreed-upon cooperative R&D or technology arrangement between firms, such as joint ventures, technology partnerships and informal networking arrangements.

Contract R&D serves as an instrument to access knowledge resources that may subsequently be redeployed with existing resources in a way superior to a competitor's deployment (Barthélemy and Quélin, 2006; DeSarbo et al., 2005). Contractual forms of collaboration include also licensing agreements which, in contrast to strategic alliances, introduce rather passive relationships.

The various types of collaborations appear to play a special role when new firms try to develop competitive advantages. New product development and market introduction, although crucial for high technology new firms' successful performance, can be costly and time consuming processes with uncertain outcomes and this according to Haeussler et al., (2010), constitutes a major reason for the employment of strategic alliances. Collaboration is important for startups to gain the knowledge necessary to develop or acquire the capabilities needed for NPD, R&D, innovation, design, manufacturing, or even technical services (Haeussler et al., 2010; Stam et al., 2007; Park et al., 2005) as well as to gain higher rates of growth (Stearns, 1996).

Within the present research firms' collaborative activities were operationalized using four variables: participation in strategic alliances, agreements regarding R&D, technical cooperation and licensing.

All multi-item scales pertaining to dynamic capabilities were tested following Confirmatory Factors Analysis (CFA) in order to confirm that particular items relate to a specific dynamic capabilities construct. Therefore five different dynamic capabilities constructs or composite variables were produced. All of these composite variables were constructed as averages of multi-item Likert-type scales, where higher numbers pointed to a "higher quantity" of what was measured. Annex I presents all relevant CFA details. As shown there, all multi-item scales representing dynamic capabilities were reasonably valid and reliable.

Dependent variables

Firms generally find unprofitable growth difficult to sustain over time. Therefore, growth in firm size provides an alternative basis for assessing patterns of firm performance over time. Growth of firms can be measured in terms of inputs (e.g. employees), value (e.g. assets) or outputs (e.g. sales revenues). Here, growth is measured by the variations in employees. Indeed, this is one of the most widely used indicators in the empirical literature on firms' growth (Delmar, 1997; Weinzinmer et al. 1998; Helfat et al.). For example, it is widely agreed that measuring employees' growth is especially appropriate for new ventures, where the number of employees often grow before any sales occur (Piva et al., 2012). In addition, human resources are among the most important assets a new firm has.

A continuous variable measured average employment growth over the past three years. Because the empirical distribution was highly non-linear with extreme skweness and kurtosis, we transformed this variable to range between 1 (negative growth) and 10 (corresponding to the 10% to 90% percentiles of the empirical distribution).

In addition we measured firm performance as the percentage of sales obtained in international markets during the last three years (continuous variable). Internationalization exposes young firms to multiple and diverse exogenous (e.g., competitive conditions) and endogenous stimuli (e.g., resource demand) (Sapienza et al., 2006). It reflects the degree of young firms' success in pursuing opportunities beyond domestic markets. Finally, we measured innovative performance in terms of the radicalness of product innovation in the last three years as an ordinal variable taking the values of 0 (= no innovation); 1 (= new-to-firm); 2 (=new-to-market); and 3 (= new-to-world product innovation).

Controls

As control variables we use founders' human capital (in terms of the founding team size and the average educational attainment of founders) and firm size in terms of turnover during the last three years. Founding teams have a strong imprinting effect on the subsequent stages of a young firms firm's life cycle, thus, critically influencing its survival (Geroski, Mata and Portugal, 2010) and growth (Eisenhardt and Schoonhoven, 1990). For each individual member of the founding team we measure educational attainment using an ordinal variable taking the values: 1 – elementary education; 2 – secondary education; 3 – Bachelor degree; 4 – Postgraduate degree; 5 – PhD degree. We average across team members to derive an overall measure of founders' education.

4. Empirical results and discussion

4.1 Dynamic capabilities in young firms-descriptive results

Table 2 presents the descriptive statistics (mean values) of the dynamic capabilities constructs (please see Annex for a presentation of the items used to generate each construct) and provides a first indication of their development and use within the newly-established firms of our sample.

Table 2: Development of dynamic capabilities in young firms

	Total sample	**High-tech subsample**	**Low-tech subsample**	
	Mean value (N=2219)	Mean value (N=1035)	Mean value (N=1184)	t-test statistic (eta squared value)

New product development capability	3.75	3.82	3.68	4.156* (0.008)
Market sensing capability	3.76	3.86	3.67	4.988* (0.011)
Technology sensing capability	2.66	2.89	2.45	9.006* (0.036)
Networking capability	3.06	2.93	3.17	-6.261* (0.017)
Participation in technology collaborations	1.88	2.12	1.66	12.724* (0.069)

Notes: t-statistic significant at 1% or 5% level of significance. Eta squared value in parenthesis. The guidelines (proposed by Cohen, 1988) for interpreting the eta squared value are: .01=small effect, .06=moderate effect, .14=large effect

In general, it appears that the young firms of our sample, which in their grand majority are micro and small firms, have developed to a larger extent dynamic capabilities related to new product development and market adaptation while they have built up to a smaller degree capabilities related to changes in technology and technology collaborative agreements. This result may be attributed to the fact that at this stage of their life young companies are more focused onto scanning business environment, addressing customer needs and introducing new product offerings matching in this way their resources with market requirements. However, due to their liability of newness and limited resources their effort related to adapting their technologies (radical change in their resource base in terms of acquisition or transformation) is less intensive indicating they are more likely to adopt an altered use of existing resources in order to address changing circumstances at the market side.

Although firms demonstrate on average a moderate interest at networking[2], the descriptive results indicate that they don't participate or participate to a limited extent in technological collaborations (M=1.88, SD=0.87). This may be related to their limited resources, lack of trust and sometimes lack of clear goals and objectives due to newness. Furthermore, owing to the fact that the specific collaborations

[2] Network content (inter-personal and inter-organizationanl relationships) changes throughout the lifetime of an entrepreneurial venture. During the early phases of a venture's life entrepreneurs are particularly concerned with building personal networks in order to overcome the liability of newness, to mobilize necessary resources such as information and knowledge and promote the emerging business. More strategic networks emerge later in the life of the firm when issues such as growth and profit making arise. Once the operating foundation has been established the entrepreneur/founding team becomes more aware of the strategic aspects of the networks which tend to consist of relations with customers, suppliers or competitor organizations and can be important conduits for information and know-how (Schutjens and Stam, 2003; Lechner and Dowling (2003).

have a strategic orientation it is more likely that young firms decide to get involved in such collaborations later on in their lifetime.

Despite the fact that independent samples t-tests indicate that the mean value differences in DCs between high and low-tech firms are statistically significant, eta squared tests suggest that the identified differences are particularly small and thus of limited practical importance. In this line of argument, for example, our findings indicate that new product development (NPD) and market sensing capability are more or less equally present in both high-tech and low-tech young firms. It is rather sensible that especially new companies that are striving to earn and keep a piece of the pie by creating or entering markets invest in and develop both market sensing and NPD capabilities. Shorter life cycles of products and the aggressiveness of global markets intensify strategies of all types of companies towards translating market messages into new products ready to entice customers. On the other hand the t-statistic and eta squared results (moderate effect) indicate that firms in low and medium-tech sectors participate less in technology collaborative agreements compared to high-tech manufacturing firms and high-tech knowledge intensive services. This finding indicates that participation in specific collaborative agreements is significantly related to the technological content and complexity of the products offered.

4.2. The impact of DCs on firm performance

DCs appear to have a positive and significant effect on the innovative performance of young firms and more specifically on the probability to introduce radical innovations, i.e. innovations that are new to the world. Market and technology-sensing capabilities allow them to effectively look for new opportunities on both market and technology fronts and thus may play a catalytic role in innovative performance. Furthermore, participation in technology collaborations enables newly-established firms to absorb external knowledge that might prove essential to identifying new product and process development opportunities. Finally, product-development capability appears to be significantly related to innovative performance, as both the potential for developing higher-quality products and new products can contribute to offering differentiated outcomes of increasing value and quality. Findings suggest that the abovementioned dynamic capabilities are significant for both high and low-tech firms. The only exception is market sensing capability which appears to be significant only for innovative performance of low-tech firms. Thus, both market and technology sensing capabilities enhance the adequate exploration of new opportunities in market and technology fronts and may play a catalytic role in innovative performance of firms in low-tech sectors.

Table 3: The impact of DC's on innovative performance

	Radicalness of innovation (ordered logit)		
	Total sample	High-tech	Low-tech
founding team size	0.006	0.006	0.003
avg. founding team educational attainment	0.026***	0.037***	0.008
average turnover	0.008**	0.016**	0.007*
product development capab	0.052***	0.069***	0.039***
market sensing capability	0.014**	0.004	0.014**
technology sensing capability	0.047***	0.069***	0.024***
networking capability	0.007	0.008	0.007
technology collaborations	0.029***	0.024**	0.025***
Log likelihood	-2522.617	-1198.615	-1314.342
LR test(x^2)	363.80***	212.18***	119.49
Number of obs.	1987	946	1041

Notes: Average marginal effects are reported. Three, two and one asterisks correspond to p<0.01, p<0.05 and P<0.1, respectively

When we explore the impact of dynamic capabilities on performance using as a dependent variable the percentage of sales in international markets we observe that technical adaption and participation in technology collaborations have a positive and significant sign, while market adaptation appears insignificant. This practically means that keeping up with technological developments and acquiring or subtracting technology resources appears to be more important for international markets presumably due to their requirements for highly innovative products.

Table 4: The impact of DC's on sales in international markets

	Sales in international markets (linear regression)		
	Total sample	**High-tech**	**Low-tech**
founding team size	0.185	-0.167	0.291
founding team educational attainment	3.414***	4.020***	1.972**
avrg. turnover	3.142***	3.760***	3.105***

product development capabil	-0.305	1.959	-1.524
market sensing capability	0.040	-1.403	0.583
technical sensing capability	2.926***	4.154***	1.503*
networking capability	0.892	-1.125	2.388**
technology collaborations	2.567***	1.947*	2.807**
constant	-15.146***	-16.695**	-11.379**
R squared	0.088	0.107	0.073
R squared adjusted	0.085	0.099	0.070
Number of obs.	1987	946	1041

Table 4 also shows that technology collaborative agreements and technical sensing capability are positively related to the firms' presence in international markets both in high and low-tech sectors. In addition, networking capability appears to be a significant driver of international sales performance for young low-tech firms. The findings suggest that the capability to exploit networks' ties and technology collaborative agreements for accessing and developing critical resources are key factors to internationalization. Given the liability of newness and the highly competitive international markets it seems that it is essential for young low-tech and high-tech firms to mobilize networks and strategic collaborations to overcome resource and knowledge deficiencies and achieve international presence and growth. Technology sensing also appears to have a statistically significant positive impact on international sales. New international ventures usually position themselves on product differentiation through the development of unique, knowledge-intensive offerings facilitated by technological innovations. Thus, technical sensing and adaptation i.e. the capability to absorb and integrate new technological knowledge and information is vital to create value activities and thus be able to target and deliver to global (niche) markets irrespective of sectoral classification.

Regression analysis results in Table 5 suggest that dynamic capabilities have, in general, a significant impact on employment growth. More specifically it appears that networking and technology collaboration activities have a significant positive effect on average employment growth under both environmental conditions examined. This suggests that the leverage and mobilization of various network ties and technology collaborations assists young firms to acquire market knowledge, know-how, technological knowledge, finance and other resources that they do not possess but are essential to their survival and growth.

Table 5: The impact of DC's on average employment growth

	Average growth in employment (ordered logit)		
	Total sample	**High-tech**	**Low-tech**
founding team size	0.001	0.002	-0.003
founding team educational attainment	0.002	0.005	-0.008
average turnover	0.014***	0.014***	0.016***
product development capabil	0.002	-0.001	0.005
market sensing capability	0.005	0.004	0.006
technology sensing capability	0.002	0.001	0.002
networking capability	0.009***	0.006*	0.015***
technology collaborations	0.015***	0.012***	0.017***
Log likelihood	-1825.025	-872.105	-940.687
LR test(x^2)	140.21***	89.44***	58.67***
Number of obs.	1874	902	972

Notes: Average marginal effects are reported. Three, two and one asterisks correspond to p<0.01, p<0.05 and P<0.1, respectively

New product development and technology sensing capabilities have a positive but insignificant effect on new firms' growth. This suggests that young firms tend to pursue growth through developing networking and technology collaboration capabilities rather than adapting their technologies and developing new products themselves.

5 Concluding remarks

In this paper we have attempted to empirically explore the applicability of the dynamic capabilities concept in a large sample of newly-established European operating in distinct environmental conditions. In order to measure dynamic capabilities we have used the following constructs: market sensing capability, technology sensing capability, product development capability, networking capability and capability to participate in collaborative technology agreements.

In sum, our findings empirically support the assertion that dynamic capabilities can be present in newly-established firms which in their majority are micro and small firms. More specifically young firms appear to develop to a larger extent new product development and market sensing capabilities while they have built up to a smaller degree those capabilities related to technology sensing and technology collaborative agreements. This may be attributed to the fact that at this stage of their life young companies are more focused onto scanning business environment, addressing customer needs and introducing new product offerings matching in this way their resources with market requirements. However, due to their liability of newness and limited resources their effort related to adapting their technologies is less intensive indicating they are more likely to adopt an altered use of existing resources in order to address changing circumstances at the market side.

Our findings also suggest that, in general, dynamic capabilities have a positive relationship with new firms' growth, international sales, and innovative performance. In particular, almost all constructs of dynamic capabilities appear to have a strong effect on innovative performance suggesting a significant link between DCs and the innovative capacity of young firms which empowers them to successfully exploit new entrepreneurial opportunities.

A firm's presence in international markets appears to be more dependent on technology adaptation rather than market adaptation indicating that to extend its scope of activity beyond national borders; a young firm has to readjust its technical resources and capabilities to fit the new conditions it faces in the foreign market. In addition, participation in technology collaborative agreements appears to have a positive impact on all performance measures. This may be attributed to the fact that new firms that establish technological collaborations/alliances can draw on complementary resources and capabilities provided by their partners and face their internal shortage of resources. In this way, they can possibly complement and expand their resource and knowledge base and support (new) business projects being able to innovate, grow and improve their presence in international markets.

Most importantly, DCs appear to have, in general, a positive impact on the performance measures of firms in both sector subsamples tested. This suggests that dynamic capabilities can be of value and generate competitive advantage under various conditions of environmental dynamism.

The findings and implications of this research should also be considered in light of its limitations. Although considerable efforts were made to ensure data quality, both during the data collection and construct validation phases, the potential of survey biases cannot be excluded. The study relies on a member of the founding team as the key informant of the firm's capabilities. Although we tried to identify the most

knowledgeable informants within each firm, in future research multiple informants will be helpful to check for inter-rater validity and to improve to internal validity of this kind of studies. In addition, the proposed dynamic capabilities dimensions are not considered to be exhaustive, but merely as representative. Firms may develop multiple types of dynamic capabilities thus further research could identify and test additional processes that would more broadly capture dynamic capabilities in young firms

However, despite the study's abovementioned limitations we believe that our analysis contributes to research on dynamic capabilities in two ways. First, the study's findings by indicating that young, small firms can also benefit from dynamic capabilities can help better specify boundary conditions for dynamic capabilities theory which is a significant precondition for any theory to move forward. Second, the study's industry design allows for comparing the efficacy of DCs in settings characterized by differing degrees of dynamism. The paper therefore contributes to answering "under what conditions does the presence of DCs generate competitive advantage?" one of the most interesting questions in the field of strategic management today (Verona and Zollo, 2011).

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Annex 1

CFA analysis results

Table A11: CFA analysis results for sensing capability

Sensing capability	**Construct indicators**	**Standardized first-order loadings**
Market sensing	Our firm actively observes and adopts the best practices in our sector	0.650[a]
	Our firm responds rapidly to competitive moves	0.707*
	We change our practices based on customer feedback	0.676*
	Our firm regularly considers the consequences of changing market demand in terms of new products and services	0.750*
	Our firm is quick to recognize shifts in our market (e.g. competition, regulation, demography)	0.779*

	We quickly understand new opportunities to better serve our customers	0.770*
Technological sensing	Employees share practical experiences on a frequent basis	0.524[a]
	There is a formal R&D department in our firm	0.640*
	There is a formal engineering and technical studies department in our firm	0.719*
	Goodness-of-fit statistics	
	χ^2(d.f.)	920.378(35) p=0.00
	CFI	0.911
	RMSEA	0.79

[a] Loadings are fixed to 1 for identification purposes. All factor loadings are significant at p <0.05 level.

Table A12: CFA analysis results

Firm capability	**Construct indicators**	**Standardized first-order loadings**
New product development capability	Capability to offer novel products/services	0.712[a]
	Capacity to adapt the products/services to the specific needs of different customers/market niches	0.484*
	Marketing and promotion activities	0.407*
R&D and alliance related capabilities	R&D activities	0.761[a]
	Networking with scientific research organizations (universities, institutes, etc.)	0.621*
	Goodness-of-fit statistics	
	χ^2(d.f.)	178.30(8) p=0.00
	CFI	0.942
	RMSEA	0.73

[a] Loadings are fixed to 1 for identification purposes. All factor loadings are significant at p <0.05 level.

Table A13: CFA analysis results: Networking capability

Construct indicators	**Standardized first-order loadings**
Selecting suppliers	0.592[a]
Recruiting skilled labor	0.565*

Collecting information about competitors	0.580*
Accessing distribution channels	0.612*
Assistance in obtaining business loans/attracting funds	0.596*
Advertising and promotion	0.588*
Developing new products/services	0.621*
Managing production and operations	0.677*
Assistance in arranging taxation or other legal issues	0.559*
Exploring export opportunities	0.559*
Goodness-of-fit statistics	
χ^2(d.f.)	920.378(38)
CFI	0.919
RMSEA	0.79

[a] Loadings are fixed to 1 for identification purposes. All factor loadings are significant at $p < 0.05$ level.

Table A14: CFA analysis results: Participation in technology collaborations

Construct indicators	**Standardized first-order loadings**
Strategic alliance	0.548[a]
R&D agreement	0.743*
Technical cooperation agreement	0.702*
Licensing agreement	0.523*
Research contract-out	0.549*
Goodness-of-fit statistics	
χ^2(d.f.)	160.688(5) p=0.00
CFI	0.963
RMSEA	0.88

[a] Loadings are fixed to 1 for identification purposes. All factor loadings are significant at $p < 0.05$ level.

CFI and RMSEA measures (CFI >0.9 and RMSEA <0.9) indicate an acceptable fit of the data to the constructs tested.

Table A15: Reliability analysis for CFA constructs

Constructs	**Cronbach's Alpha**
Market adaptation	0.857

Technical adaptation	0.617
New product development capability	0.611
Networking capability	0.845
Participation in technological collaborations	0.742

All capabilities constructs can be considered as reliable based on Cronbach's Alpha indicator (>0.6).