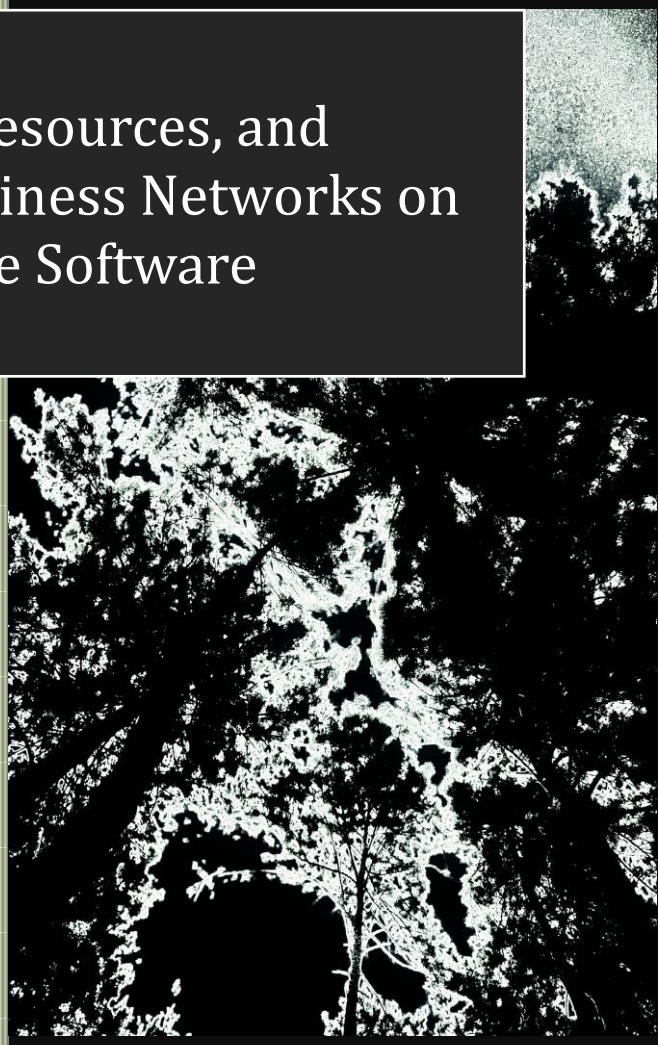
The Impact of Internal and External Resources, and Strategic Actions in Business Networks on Firm Performance in the Software Industry



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The Impact of Internal and External Resources, and Strategic Actions in Business Networks on Firm Performance in the Software Industry

Proefschrift

ter verkrijging van de graad van doctor
aan de Technische Universiteit Delft,
op gezag van de Rector Magnificus prof. ir. K.C.A.M. Luyben,
voorzitter van het College voor Promoties,
in het openbaar te verdedigen op Maandag 24 November 2014 om 12.30 uur

door

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ISBN: 978-94-6259-434-0
English language check by Gert Stronkhorst, Amsterdam
Printed by: Ipskamp Drukkers B.V., Enschede

To my son, Ardra Adhyatma

Table of Contents

List of Figures

List of Tables

1. Introduction

Firms are increasingly connected with other firms in business networks to access value enhancing resources. In these business networks, firms have to deal with their competitors and collaborators simultaneously. This means that understanding variance in firm performance requires us to look at business networks as an integrated part of a firm's external environment (Hakansson & Snehota, 2006). This chapter introduces our main research question: *What are the roles of internal and external resources, and strategic actions in business networks, and what is their relationship with firm performance?* To answer this question, we build on previous studies by Zaheer and Bell (2005) and Lavie (2006), extending the Resource-based View (RBV) with external resources (i.e. resources that are obtained from the firms' business network), by Barney and Arikan (2001), extending the RBV with strategic actions, and by Venkatraman, Lee, and Iyer (2008), and Koka and Prescott (2008) on the strategic actions of firms in business networks.

1.1. Business networks, firms and firm performance

Since the 1990s, firms engage more in partnerships (Harbison & Perkar Jr., 1998) and are more embedded in large and well-connected business networks (Cloodt, Hagedoorn, & Roijakkers, 2010), which gives them access to scarce resources and enable them to capture business opportunities that emerge in their external environments (Granovetter, 1985; Gulati, 1998; Gulati, Nohria, & Zaheer, 2000). Partnerships provide access to resources that complement to the firm's internal resources, which can lead to improved firm performance (Madhok & Tallman, 1998; Park & Russo, 1996) or innovativeness (Ahuja, 2000; Schilling & Phelps, 2007). Also through partnerships firms can acquire technology or have to access markets which provide benefits like knowledge creation and sharing, talents, technological innovations and regulatory harmonization.

Being part of a business network also creates strategic challenges that may have a negative influence on a firm's performance. When resources are exchanged between firms, firms to some extent may lose control over conditions that turn their resources into a competitive advantage. Sharing resources with partners also makes them more dependent on and vulnerable to the discretion and expertise of others (Lavie, 2006; Oliver, 1997), which may create high coordination costs, slow down their capital accumulation (Lee, Park, Ryu, & Baik, 2010b), and may create overembeddedness, which reduces their ability to enter into new more valuable

partnerships (Hagedoorn & Frankort, 2008). In other words, the potential costs of being part of a network may reduce a firm's competitive advantage, and hence their performance.

These effects depend on the firm's strategic actions when engaging in competitive or collaborative behaviours that co-exist in a business network (Clarke-Hill, Li, & Davies, 2003). Competitive and collaborative behaviours create different opportunities or threats[1] for a firm. Competitive behaviours between firms create a competitive environment characterized by constant rivalries, bargaining, and the use of power to compete for scarce resources and markets (Clarke-Hill et al., 2003). The collaborative behaviour of firms creates a collaborative environment that ideally is characterized by mutual benefits, sharing reciprocity and trust (Clarke-Hill et al., 2003). These characteristics of business networks are important to take into account for firms to share their resources effectively and efficiently and to leverage their resources and those of their partners, which will add to their competitive advantage.

We explain variance in firm performance by looking at a firm as an actor that is competing in its competitive environment and also a member of its collaborative environment. Doing so, we extend the boundary of a firm's playing field to include its relationships to collaborators and competitors that are understudied as suggested by Priem, Butler, & Li (2013). Viewing a firm as an actor, we put emphasis on internal resources that underlie firm competitiveness. Viewing a firm as a member of a collaborative environment, we put emphasis on a firm's position in relation to other firms.

A basic premise of the Resource-based View (RBV) is that a firm is an actor in its competitive environment. When it's resources meet the VRIN conditions (e.g. they are valuable to customers, rarely available, difficult to imitate and non-substitutable), these resources are regarded as unique and contributing to firm competitive advantage and therefore are considered to explain variance in firm performance (Barney, 1991). A firm, as a member of its collaborative environment, is the basic premise of the network perspective. The network perspective[2] asserts

[1] We used opportunities and threats terminology to describe the changes/dynamics that occur in a firm's external environment as they are generally used in SWOT analysis. Opportunities refer to future factors in a firm's external environment that may improve competitive advantage, while threats or challenges refer to those factors in a firm's external environment that may reduce its competitive advantage.

[2] The network perspective incorporates theoretical and empirical concepts and focuses on the positive effects of interorganizational networks to an organization's performance. The network perspective provides a methodology and theoretical perspective to understand the source of a firm's competitive advantage (Zaheer and Usai, 2004) which originates from the resources that a firm's

that variance in firm performance can be related to the constraints and opportunities that are determined by a firm's position in a network of relationships with other firms (Gulati, 2007; Hanneman & Riddle, 2005). This network provides a firm with access to external resources that are crucial to improving its performance. Similar to the RBV, the network perspective emphasizes a firm's position in its network as a distinct property of a firm and, as such, a source of competitive advantage (Gulati, 2007).

Both perspectives can be considered to be more concerned with the possessing of critical resources as a source of competitive advantage, be it rooted in internal or external resources, and undervalue the importance of strategic actions (Madhok & Marques, 2014). Although internal and external resources are sources of competitive advantage, a firm's competitive advantage may dissipate with emerging business opportunities and threats in its business network. Available resources and markets are limited, which means that firms engage in constant rivalries with other firms to outperform each other. Opportunistic behavior may emerge as a result of resource sharing. Sharing resources may also cause firms to imitate each other. Changing business opportunities, constant rivalries among competitors and opportunistic behavior among partners may dissipate a firm's competitive advantage and have an adverse effect on its performance. Consequently, it is interesting to examine the effects of resources and strategic actions in business networks on firm performance.

1.2. Looking at the Resource-based View: The gaps

The RBV has become the main theory being used to explain variance in firm performance. It has successfully attracted the interests of researchers as it is regarded as a comprehensive and empirically testable theoretical framework (Newbert, 2007). While it gains its prominence, the RBV has been criticized on several issues. The main criticisms revolve around the positioning of the RBV as a theory as the RBV fails to provide a sound conceptual basis for resource identification that leads to problems in empirical investigation using the RBV (El Shafeey & Trott, 2014; Priem & Butler, 2001b; Sanchez, 2008). Newbert (2007) and Nothnagel (2008) reported that some 50-60% of relevant empirical tests report a positive and significant relationship, the rest shows an insignificant or in a negative relationship. Moreover, the explanatory power of unique internal resources on firm performance is relatively small (Nothnagel, 2008). Armstrong and Shimizu

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partners may possess and that are available to a focal firm through its connections with those firms (Gulati, 2007).

(2007) showed similar findings by reporting low variance explained by firm resources (0.08 on average). These findings suggest that variables are missing (Armstrong & Shimizu, 2007; Nothnagel, 2008). This might be related to the problem of generality of the conceptualization of the RBV and it is suggested that different contexts require a different conceptualization of the RBV (El Shafeey & Trott, 2014). The RBV argues that the variance in firm performance can be attributed to the uniqueness of resources controlled by a firm. It uses efficiency related explanations and adopts the position that conditions in a firm's external environment are constant (Peteraf & Barney, 2003). In a context where a firm simultaneously competes and collaborates, failing to look beyond internal resources and orientation may be the reason for the low explanatory power and mixed empirical findings we witnessed in studies (Armstrong & Shimizu, 2007; Nothnagel, 2008). We argue that there are two explanations for the mixed empirical findings: (1) the exclusion of a firm's external resources (Lavie, 2006; Zaheer & Bell, 2005) and (2) the exclusion of a firm's strategic actions in the relationship between its resources and its performance (Madhok & Marques, 2014; Koka & Prescott, 2008; Venkatraman et al., 2008; Barney & Arikan, 2001). These arguments resonate with the critics on the conceptualization of resources (El Shafeey & Trotts, 2014; Sanchez, 2008; Priem & Butler, 2001a, b).

The first argument is related to the characteristics of firm resources, which are complex in nature. Resources are the accumulation of a firm's assets over time, which make them unique to a firm. Due to increased technological complexity in a high technology industry, firms increasingly use partnerships with other firms or organizations to access the required resources. These external resources complement their internal resources. While each type of resource helps to explain variance in firm performance, the interaction of these resources may also explain a part of the unexplained variance in performance (Mahmood, Zhu & Zajac, 2011). If we do not acknowledge the network context within which firms operate, the importance of their external resources and the way internal and external resources affect each other, we could fail to understand the underlying mechanism of resources as important sources of competitive advantage.

The second argument is related to the RBV's assumption that conditions in a firm's external environment are constant (Peteraf & Barney, 2003), which means that the RBV focuses on an internal orientation with regards to its responses to external environment. The internal orientation basically states that a firm's competitive advantage is obtained through efficiency-related explanations rather than strategic actions (Peteraf & Barney, 2003). Efficiency-based explanations can, however, only explain firm performance as a result of a firm's internally oriented actions. Firms respond with externally oriented actions which manifest through strategic actions, such as partnerships or acquisitions, in order to control its

external environment and not being dependent on arms-length trading or internal oriented efficiency-based explanations. Firms need to strategically respond to emerging opportunities and threats in their external environment. These strategic actions reflect a firm's preparedness and proactive posture to shape or respond to threats and opportunities. They are the instruments needed to safeguard a firm's sources of competitive advantage and build new ones.

To summarize, in order to understand variance in firm performance we argue to: (1) incorporate external resources that are available through partnerships instead of through the market; and (2) extend the RBV by incorporating strategic actions as a factor influencing the relationship between a firm's resources and its performance. Following these two arguments, we need to look at the nature of and changes in a firm's external environment. Using the RBV alone to explain firm performance in an environment characterized by collaborative and competitive forces may cause a misunderstanding of the relationship between a firm's resources and its performance. Broadening the domain challenges the RBV's basic assumption of a firm's external conditions being constant (Peteraf & Barney, 2003). Consequently, a network perspective is needed to complement our understanding of the relationship between firm resources and its performance as suggested by Wassmer & Dussauge (2011). The network perspective complements the RBV, since it emphasizes the resources that are not under a firm's complete control but still contribute to its performance. It has common logic with the RBV: they both argue that sources of variance in firm performance are caused by a firm's unique properties.

While these two perspectives explain variance in firm performance, they still suffer from the passive view of creating variance in firm performance, which is caused mainly by the assumption that the connection between a firm's resources and actions designed to acquire and exploit those resources are self-evident (Barney & Arikan, 2001; Koka & Prescott, 2008), which often is not the case. Because firms may take strategic actions in response to their external environment that change and transform their existing strategic direction (Barney & Arikan, 2001), strategic actions are important in influencing the relationship between a firm's resources and performance. By explicitly including strategic actions, our aim is to explore the "link between resources and the strategies that may not often be so obvious" (Barney & Arikan, 2001).

1.3. Research questions

The RBV is the mainstream theory used in strategic management research to explain variance in firm performance. The RBV's main contribution is the premise of heterogeneity of firm-specific resources as a source of a firm competitive

advantage. However, the RBV assumes external conditions to remain constant and it has a passive view on how value is created. This study provides a conceptual framework to explain firm performance that complements the RBV with external resources, e.g. resources which firms have access to through partnerships, and the strategic actions firms adopt to engage in business opportunities or fence of competition. This leads to the following main question:

What are the roles of internal and external resources, and strategic actions in business networks, and what is their relationship with firm performance?

We consider firms as autonomous organizations operating in a business network with partners, with the aim of outperforming their competitors. In line with the RBV, we view firms as bundles of internal resources. In addition, firms use partnerships to provide access to complementary external resources. We conceptualize a firm's resources in a business network by asking the following questions:

Q1: *What are firm resources in a business network?*

Q2: *What is the relationship between firm resources in a business network and firm performance?*

The aim of these questions is to identify the sources of a firm's competitive advantage and how these sources affect firm performance. We derive our arguments from the RBV and complement it with a business network perspective.

The business network provides opportunities and threats that affect the relationship between firm resources and performance. We argue that firms need to respond strategically to emerging opportunities and threats in their business network, which can enhance but also erode a firm's competitive advantage. Firms may respond with strategic actions to address them. This brings us to the following questions:

Q3: *What are the various kinds of strategic actions that firms can adopt in a business network?*

Q4: *How can firm strategic actions in a business network be measured?*

A firm's business network or collaborative environment is characterized by dependency and openness, while the competitive environment is characterized by rivalries and autonomy. The different characteristics of the two environments are sometimes conflicting, creating a tension in the firm's strategic actions. Consequently, we look at the importance of a firm's concerted strategic actions as an instrument to overcome or at least deal with these conflicts and tensions. We propose a measurement tool that can be used to systematically measure a firm's

strategic actions responding to emerging opportunities and threats in both environments.

1.4. Research setting

We examine firms in a high technology industry that is characterized by high levels of competition and collaboration. In high-technology industries, knowledge and technology creation is fundamental to the firms' competitive advantage and firm performance (Narasimhan, Rajiv, & Dutta, 2006; Schilling & Phelps, 2007). These firms create complex technological products with high fixed costs and low marginal cost, that requires the collective efforts of multiple partners to create products, services and technologies (Iansiti & Levien, 2004; Schilling & Phelps, 2007). High technology industries also experience dynamic and extensive partnership activities that are used by firms to improve their performance (Rosenkopf & Schilling, 2007; Schilling & Phelps, 2007), which means that firms operating in high technology industries face elements of cooperation as well as competition (Bettis & Hitt, 1995; Bresnahan & Greenstein, 1999).

In this study, we chose the pre-packaged software industry for empirical analyses. This industry has relatively low entry barriers, which causes intense competition. This industry is mature and is characterized by competition and collaboration. In addition, products in the pre-packaged software industry are highly complex and consist of interrelated technologies. Consequently, almost no firm by itself has all the capabilities to efficiently or effectively create value for end customers.

1.5. Research approach

We take a step-wise approach to investigate our research questions, starting with a literature study, with the aim of developing a framework for investigating various factors affecting a firm's performance and conceptualizing the relevant constructs.

Addressing **Q1** and **Q2**, we operationalize constructs firm resources in a business network (e.g. its internal and external resources) and investigate the possible relationships between firm resources and firm performance. We use a single industry research design, which allows us to identify critical resources (Hoskisson, Hitt, Wan, & Yiu, 1999) and collect fine-grained network data (Hoang & Antoncic, 2003). We operationalize the constructs with measures that have been tested and used in previous research, and ensure the appropriateness of the choice to our research focus. We collect secondary data from various sources (the Compustat database, annual reports and the SDC Platinum database). We develop a network of firms, which we develop from samples of strategic agreements between 2002 and 2007. We use a network analytical tool, UCINET 6, to calculate network variables based on the strategic agreements data. To investigate the hypothesized

relationships between the constructs, we use hierarchical regression modelling, which enables us to examine the influence of each independent variable on the dependent one.

To address **Q3**, we continue the empirical analyses with an investigation of patterns of strategic actions by firms in their competitive and collaborative environments. We choose a case study approach, which enables us to carry out an in-depth investigation. We conduct case studies involving four firms that are randomly selected from a set of firms with similar resource configurations but contrasting levels of performance. In this way, we can investigate the various strategic actions and the relationships between these firms' business network resources and their performance. For our case studies, we collect data from secondary data sources, i.e., annual reports, news and press releases, letters to stockholders and other related documents.

The final stage of the empirical work involves the development of constructs and scales for measuring the firm's strategic actions. To that end, we develop and test an instrument to measure a firm's strategic actions in a fine-grained manner. We collect data from a survey among a sample of high technology firms. We use Confirmatory Factor Analysis to test the instruments, thereby addressing **Q4**.

1.6. Outline of the dissertation

As shown in Figure 1, we organized this dissertation in six chapters. After the introduction, we build and discuss the conceptual framework for answering the main question, "***What are the roles of internal and external resources, and strategic actions in business network, and what is their relationship with firm performance?"*** in **Chapter 2**. We base our discussion on the existing theoretical and empirical literature, i.e. based on the Resource-based View and the business network perspective.

We report the first empirical work addressing **Q1** and **Q2** in **Chapter 3,** where we develop the constructs of the firm's internal and external resources, the construct of firm performance and we hypothesize and empirically test the relationships between the three constructs. The findings are used to investigate our arguments regarding the need for a contingency factor in the relationship between a firm's resources and performance. In **Chapter 4**, we address **Q3** by empirically examining the patterns of strategic actions by firms and the fit between a firm's strategic actions and resources. We present the conceptualization of a firm's strategic actions in its competitive and collaborative environments, and investigate them empirically through case studies involving four firms.

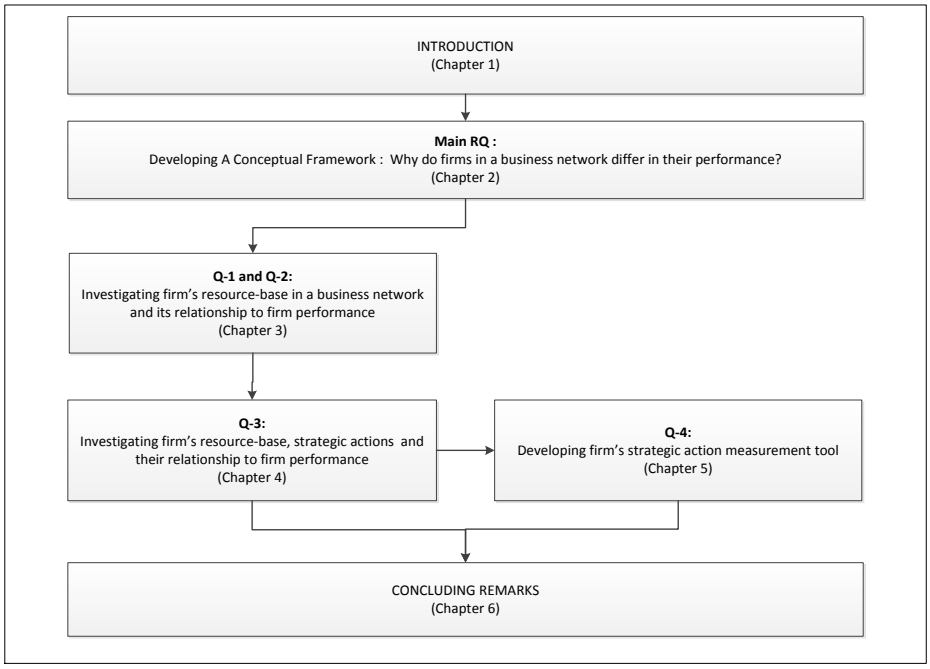

Figure 1.1. Structure of the dissertation

In the third empirical part of this study, which is discussed in **Chapter 5**, we discuss the development of an instrument to measure a firm's strategic actions in a business network in a fine-grained manner, addressing **Q4**. In **Chapter 6,** we present key findings and concluding remarks for the entire research, we address limitations and recommendations for future research and we provide recommendations for management practice.

2. Firm Resources, Strategic Actions, and Performance: A Theoretical Perspective

Strategy research revolves around the question as to why firms vary in their performance (Gulati et al., 2000; Hoskisson et al., 1999; Rumelt, Schendel, & Teece, 1994). Researchers often look at sources of competitive advantage, either in a firm's resources or positions in its environment, to explain variance in firm performance (Hoskisson et al., 1999). The RBV is a theory on the sustained competitive advantage of firms stating that firms can perform better when they have a greater competitive advantage based on their available resources. Competitive advantage is defined as having greater economic values than competitive firms, as a result of having greater net benefit from low economic costs or high perceived benefit associated with their products/services (Peteraf and Barney, 2003). Because firms operate in an environment that is both collaborative and competitive, being better than their competitors is a challenge. Working together with competitors requires a collective effort to create differentiation and/or reduce cost. At the same time, it can be difficult to maintain a competitive advantage, due to possible duplication by competitors. These opportunities and threats in the firm's external environment affect its competitive position. Thus, to explain variance in firm performance, we need to look at a firm's environment as an important factor influencing a firm performance. Performance depends on a firm's heterogeneous set of resources and strategic actions in response to emerging opportunities and threats in its external environment.

2.1. Why do firms vary in their performance?

We examine whether and how studying variance in firm performance can be related to a firm's resources and strategic actions. The theoretical background of this chapter is rooted in the RBV, the network perspective and a firm's strategic actions. Sources of competitive advantage are a firm's internal resources as well as the resources provided by its partners. Strategic actions are the instrument that is needed to enhance and protect the sources of the firm's competitive advantage, which is rooted in its unique resources. In this section, we discuss how the RBV, the network perspective and the strategic actions of a firm complement each other.

2.1.1. The RBV: Firm resources as a source of competitive advantage

The RBV emphasizes that resources are an important determinant of firm performance (Priem & Butler, 2001a), based on the assumption that firms operating in an industry (or group) are heterogeneous with regard to their resources. There are four conditions (the VRIN conditions) under which a firm's resources create sustained competitive advantage (Barney, 1991):

a. Valuable: A firm's resources are valuable when they can be used to improve the firm's efficiency and effectiveness in achieving its economic goal.

b. Rare: A firm's resources are not owned by large numbers of (potentially) competing firms.

c. Imperfectly imitable: A firm's resources are imperfectly imitable, they are firm-specific and have a high level of tacitness, so that competitors cannot easily imitate them.

d. Non-substitutable: A firm's resources are non-substitutable, as no strategically equivalent valuable resources are available.

These firm-specific resources that are valuable, rare, imperfectly imitable and non-substitutable enable firms to perform in a product market more efficiently and effectively than their competitors (Barney, 1991). This reflects a firm's ability to create more economic value than its competitors in their product market (Peteraf & Barney, 2003). When firms create greater economic value, either from low economic costs or the high perceived benefits associated with their products/services, they are more competitive than other firms (Peteraf & Barney, 2003), leading to improved efficiency and effectiveness, which in turn creates total surplus, i.e. the difference between perceived benefits and economic costs, leading to an improved firm performance (Peteraf & Barney, 2003).

The RBV has become the mainstream theory that is widely used to explain variance in firm performance. It takes an inside-out perspective on a firm (Hoskisson et al., 1999) and provides a structured framework that once the advantages of having resources are achieved, they may be sustained (Priem & Butler, 2001b). While it gains prominence, the RBV has been criticized on several issues. The main criticisms revolve around the positioning of the RBV as a theory. The RBV is said to fail in providing a sound conceptual basis for resource identification, something that leads to problems in empirical investigation (El Shafeey & Trott, 2014; Sanchez, 2008; Priem & Butler, 2001b). The VRIN framework is criticized for its tautological nature, having no chain of causality and

lacking distinct functional and behavioural properties to identify resources and explain how resources may lead to improved firm performance (Sanchez, 2008). The RBV considers resources as a single entity (Black & Boal, 1994) and thus is negligent on the effect of complex relationships between resources and on the process by which strategic resources are accumulated, coordinated and maintained (El Shaffey & Trott, 2014). Further, the RBV is also silent on the value creation that might be important to explain variance in firm performance (Priem & Butler, 2001a, b). Thus, the RBV requires other theories to provide insights from the external environment to determine the value of firm resources (Priem et al., 2013). This calls for taking into account a firm's competitive context within the RBV (El Shafeey & Trott, 2014; Sanchez, 2008).

These criticisms become manifest when looking at the empirical findings from research that has used the RBV. The empirical findings on the relationship between resources and firm performance are mixed and show a low explanatory power. Armstrong and Shimizu (2007) found that the average R-square attributable to resources are 0.06 (ranging between 0.005 and 0.367) in multiple-industry and cross-sectional design studies, and 0.08 (0.02 to 0.47) in single industry and longitudinal design studies, suggesting that there is a large unexplained variance, which implies that certain important variables are missing in the model specifications. Nothnagel (2008) reported mixed results, for both tangible and intangible resources. In an extensive review, Nothnagel (2008) reported that 29% of the tests using tangible resources as independent variables support the RBV, 63 % had insignificant results and 8% resulted in outcomes that would refute the RBV. As for intangible resources, 62% of tests were supported, 34% were insignificant and 4% were in the opposite direction. Of the 17 tests that investigate the relationship between resources in general[3], 59% were supportive, 23% were non-significant, and 18% opposed to the RBV. Scholars who found opposite or insignificant findings provided context-based explanations, such as technology complexity (Chan, Martin, & Kensinger, 1990), the position in the value chain (Shin, Kraemer, & Dedrick, 2009), and competences needed to combine and recombine internal and external knowledge (De Carolis, 2003). In other words, there are other factors that affect the relationship between resources and performance.

Important but overlooked factors are factors related to a firm's external environment, to a large extent as a result of the RBV's assumption that the

[3] Nothnagel (2008) classified resources in general as "Studies with no specific resource focus were coded in the category 'resources in general', i.e., studies which measured the impact of *resources in general* on performance".

conditions in a firm's external environment are constant (Peteraf & Barney, 2003). As a result, the RBV does not take external environmental forces or interactions with other firms into account. As a firm's environment becomes more complex, the connection between these internal resources and their external environment is important in two ways. The first is related to the conceptualization of firm resources and the second is about a firm's posture with regard to environmental forces and interaction with external environment.

The RBV conceptualization of resources leads to "all inclusive resources" as pointed out by Priem and Butler (2001b). As the RBV theoretically fails to provide the functional and behavioural properties of resources (Sanchez, 2008), research may consider all kinds of resources relevant. This might lead to low explanation power. Further, the assumption of a constant external condition is problematic for identifying resources. Barney (1991) classified resources into four categories (capital, physical, human, and organizational) which basically underline the internal orientation of the RBV in defining resources. These internal resources are not sufficient for two reasons: (1) the complexity of the technologies and products involved, and (2) the limited resources that require firms to access external sources of competitive advantage. In particular, high technology products are complex, which means they require complementary technologies, products or services to create value for the customers (Schilling, 2002). This complexity is the reason why firms may not have all the necessary resources. In addition, it may be inefficient, in terms of cost and time, to develop all the necessary resources internally (Zahra & Bogner, 2000). As a result, access to external resources of partners becomes important. Extending the analysis to include these external resources can help explain the impact of resources on firm performance better than existing empirical studies have done so far.

As for value creation, the RBV and network perspective position a firm on a passive role in shaping firm performance. It assumes resources as given (Priem and Butler, 2001b). Thus, a complementary factor is needed to address the need for a more proactive role of a firm in responding to opportunities and threats in its external environment. We propose to address a firm's proactive role using a firm's strategic actions. They reflect a firm's preparedness and proactive posture to shape and respond to threats and opportunities in a firm's business network with resources a firm has (Madhok & Marques, 2014).

2.1.2. The network perspective: The firm's external resources as a source of competitive advantage

Considering the fact that a firm's external resources are an important factor, the network perspective plays an important role. It provides a conceptualization of the

firm's position within an interconnected environment/network as a unique resource. This network is associated with resources and information sharing, through which the firms in the network share costs, information about technological breakthroughs, best and failed practices, physical assets and skills (Ahuja, 2000). Firms that can strategically create partnerships occupying a position in a network will enjoy greater net benefits than those who cannot. This position determines the quantity and quality of external resources that can be accessed by firms. A better position in the network provides firms with different benefits of the effective exchange of complementary resources, knowledge and controls, which create a competitive advantage (Gnywali & Madhavan, 2001; Pillai, 2006).

The network perspective provides a theoretical base with regard to differences between firms that can be traced back to the constraints and opportunities arising from how they are embedded in networks and from the local interaction between firms (Hanneman & Riddle, 2005). The RBV emphasizes the importance of the firm's internal resources as sources of heterogeneity. These facts underline the different sources of heterogeneity that are used by the network perspective and the RBV to explain differences in firm performance. Both internal and external resources create resource asymmetry between firms and exhibit different degrees of efficiency, leading to higher performance levels. These characteristics make the RBV and the network perspective strongly connected and complementary as suggested by, among others, Lavie (2006) and Wassmer & Dussauge (2011). Thus, while most studies adopt either one of the two perspectives, combining them will improve our understanding of the variance in firm performance, and it will help us to conceptualize a firm as a bundle of resources interacting with others in its network to access complementary resources, in order to improve its performance.

2.1.3. The firm's strategic actions: Going beyond internal orientation

Although the RBV and network perspective describe the resources of firms, they play a passive role in shaping firm performance and overlook the firm's proactive role in shaping its path towards competitive advantage (Barney & Arikan, 2001; Koka & Prescott, 2008). Both the RBV and the network perspective typically do not consider the strategic goals and self-interest of actors in shaping their resources and responding to challenges and threats in their external environment. In an uncertain environment, firms may find new ways of using resources to implement value-creating strategies that enhance and protect their competitive advantage.

In extending the RBV by adding external orientation, we put an emphasis on the firm's active role in responding to threats and opportunities in its external environment. Firms need to act strategically to ensure they are gaining benefits

from the dynamics in their external environment (e.g., Harrison, Hitt, Hoskisson, & Ireland, 2001; Koka & Prescott, 2008; Madhavan, Caner, Prescott, & Koka, 2008; Venkatraman et al., 2008). Since firms continuously face threats from their competitors and collaborators alike, their competitive advantage can dissipate, which is expected to have a negative effect on their performance. By contrast, a firm's external environment also offers opportunities that can enhance its existing competitive advantage. In this sense, we argue that a firm's strategic actions act as a moderating factor, influencing the relationship between the firm's resources, as a source of competitive advantage, and its performance (Sirmon et al., 2007). They represent firms' continuous efforts to find the best fit between the resources and opportunities/threats in their external environment, to enhance and protect their competitive advantage. Thus, looking at strategic actions help us understand the more active approach that is needed to extend the internal orientation of the RBV. Introducing strategic actions allows us to shift focus on proactive and deliberate actions in realizing potential of resources and opportunities in a firm's external environment (Madhok & Marques, 2004).

2.1.4. Conceptual framework

A firm's resources are a necessary but insufficient condition for explaining firm performance (Barney, 1997; Denrell, Fang, & Winter, 2003; Eisenhardt & Martin, 2000; Winter, 1995)[4]. It is only if these resources meet the VRIN conditions that they can be expected to help firms maintain their competitive advantage. Because firms are not isolated from their external environment, they also need to cope with external opportunities and threats by realizing the full potential of its resources, which depends on their strategic actions designed to create the optimum benefits from their resources (Barney & Arikan, 2001; Sirmon et al., 2007). Hence, examining the relationship between a firm's resources and performance may lead to a misleading conclusion if we fail to take its strategic actions into account (Ray, Barney, & Muhanna, 2004).

Current firm performance as a result of a competitive advantage rooted in unique resources may deteriorate as a result of emerging threats and opportunities in its

[4] Barney (1997) asserted the importance of organization complementing the valuable, rarity and inimitability conditions of resources. Organization entails the condition that firms must be organized to realize the full economic potential of resources and strategies (Barney, 2002). However, there are two views on these organizational conditions: (1) organization as another type of resources creating a competitive advantage and (2) organization as a complementary resource that is "not sources of competitive advantage but are nevertheless important if a firm realizes the full competitive potential of its resources and strategies" (Barney, 2005). In this sense, Barney acknowledges the idea that a firm's resources as such are not sufficient to explain firm performance.

external environment. As discussed in **Chapter 1,** firms operate in environments that are characterized by collaborative and competitive behaviour. Competition is characterized by rivalries, the use of power to compete for scarce resources and markets, while collaboration is characterized by mutual benefits, sharing, reciprocity and trust (Clarke-Hill et al., 2003). These different characteristics create different threats and opportunities to which firms need to respond. In a competitive environment, firms need to compete for scarce resources and customers. They compete for market leadership and increase their survival in markets. In a collaborative environment, resources are exchanged between firms, which may weaken the isolating mechanism of a firm's resources, including IP protection, complex relationships among several resources and the tacit nature of resources (Oktemgil, Greenly, & Broderick, 2000), which act as a barrier against by the competition. Through partnerships, firms can share and exchange resources that were previously protected through patents. There may be spill-overs during this process, which can create opportunistic actions that endanger a firm's current position (Lavie, 2006). Moreover, collaborative environments create dependencies between firms, making them less flexible when it comes to exerting their strategic actions, which has a negative effect on their performance (Gnywali & Madhavan, 2001). Firms also need to address the dependency-enhancing nature of a network by simultaneously balancing their own interest and the interests of their partners, because their actions in a network may hamper the VRIN conditions of their own resources.

Once they are embedded in competition and collaboration, firms need to respond and take strategic action to ensure that their competitive advantage is safeguarded (Bengtsson & Kock, 1999). The continuous interactions with their competitors on the one hand, and with collaborators (suppliers, strategic partners or business partners) on the other hand, represent the firm's strategic actions in respond to its external environment (Bengtsson & Kock, 1999). Responding to external environment requires both economizing and strategic actions. It requires efficiency-oriented actions and entrepreneurial actions. Efficiency-oriented actions may make a firm’s resources valuable, rare, inimitable and non- substitutable. However, entrepreneurial actions will provide firms with new ways of using their resources, allowing them to realize the full potential of their resources.

We present a conceptual framework in Figure 2.1, which takes three important factors influencing firm performance into account: (1) the firm’s internal resources, (2) the firm’s external resources and (3) the firm's strategic actions. We expect there to be an interaction between resources and the strategic actions. The strategic action can influence the magnitude and/or direction of the relationship between a firm’s resources and its performance. A fit between both constructs is likely to enhance the magnitude of and positive effect on firm

performance. Thus, when a firm performs better, that is likely to be the joint result of its internal and external resources, as well as its ability to strategically enhance and protect the sources of its competitive advantage.

Taking a firm's resources, network and strategic action into account in the model allows us to:

- Examine the interaction of the firm's internal resources and external resources.
- Examine the linkage between the firm's resources and performance by taking a firm's strategic action in a business network into account as a moderating variable between its resources and performance.

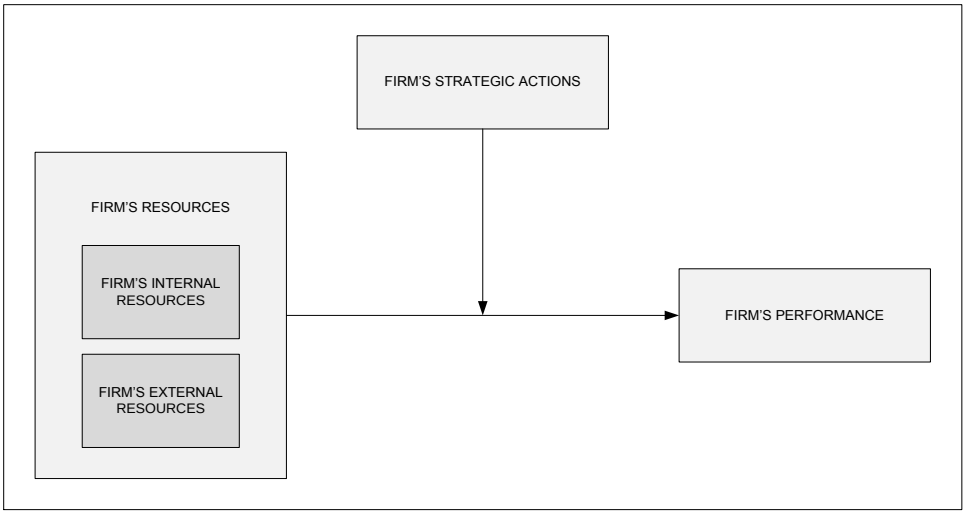

Figure 2.1 Proposed conceptual framework

2.2. Firm's internal and external resources

In this thesis, we use resources as (tangible and intangible) assets that are to some extent under the firm's control and enable a firm "*to participate in its product market relatively more efficiently and effectively*" (Barney, 1991). This definition underlines the most important characteristics of resources (Amit & Schoemaker, 1993; Peteraf, 1993; Peteraf & Barney, 2003; Teece, Pisano, & Shuen, 1997): (1) tangible and intangible assets, (2) that are under a firm's control and (3) that generate differentially greater economic value.

A firm's resources should not only be limited to tangible assets, such as physical, financial and human capital, but also include intangible assets, like knowledge,

experience and culture, which are embedded in firms. Firms should, to some extent, control their resources in order to respond continuously to changes in their environment. Firms need to have control over their resources to conceive of and implement strategies.

To improve their performance, firms cannot depend on their own resources alone. They develop relationships within a business network to access resources that are not available internally. These external resources are different from resources that are internally accumulated and fully controlled or owned by the firm. The RBV, in its original form, does not consider these external resources as sources of competitive advantage since resources are only associated in a context of competition in the RBV (Lavie, 2006)[5]. Resources are conceptualized as internal resources that are owned and controlled by a firm (Amit & Schoemaker, 1993; Barney, 1991). They are sources of competitive advantage when they are protected from competitors that manifest in the conceptualization of the VRIN condition of a firm's resources (Barney, 1991). The RBV does not consider that resources that are externally available may contribute to firm performance in a collaborative context. As more firms access and obtain benefits from their collaborations, these external resources need to be considered as one source of competitive advantage. Therefore, in a network setting, we need to distinguish two types of resources; (1) internal resources and (2) external resources. The two types of resources complement each other and having access to both will have a positive influence on a firm's performance (Gulati, 2007; Lavie, 2006; Lee, Lee, & Pennings, 2001; Zaheer & Bell, 2005). Acquiring external resources also leads to greater efficiency, since it is faster than developing them in-house (Rosenkopf & Almeida, 2003; Schilling & Steensma, 2001) and they provide considerable flexibility (Rosenkopf & Schilling, 2007).

Since we are interested in investigating firm resources in an environment that is characterized by competition and collaboration, we could expect that network-related resources will also materialize in tangible (e.g. money, materials, location) and intangible assets (e.g. information, tacit knowledge, reputation, and access to scarce resources), which may not be available without having relationships with different types of firms.

[5] As of 1999, a limited number of studies using the RBV has considered a firm's network as intangible assets. Nothnagel (2008) found that 8 out of 221 empirical tests of RBV investigate network aspects as a firm's intangible assets. This study did not pick network as resources per se but also theoretically considers that resources that are externally available have a distinct characteristics from those of internal resources and they cannot be considered as only in the context of competition.

2.2.1. Internal resources

Internal resources are available and completely under a firm's control, which means that firms have the autonomy to use them for the sake of their own strategic interests. Firm resources are essential to generating greater value and they are the restricting factors in determining how much market demand a firm is able to satisfy (Peteraf & Barney, 2003). Researchers have identified a variety of internal resources, such as physical assets (Farjoun, 1998), technological resources (Powell & Dent-Micallef, 1997; Ray et al., 2004), slack capital (Combs & Ketchen, 1999), reputation (Carmelli & Tishler, 2004; Rothaermel & Deeds, 2006) patents (Mowery, Oxley, & Silverman, 1996), technological competences/capabilities (De Carolis, 2003; Schilling & Steensma, 2001), marketing (De Carolis, 2003; Spanos & Lioukas, 2001), human resources skills and knowledge (Welbourne & Andrews, 1996; Wiklund & Shepherd, 2003).

Different resources are needed to establish meaningful relationships with firm performance (Armstrong & Shimizu, 2007). In high technology industries, marketing and technological assets are identified as being critical resources that enhance firm performance. Both technological and marketing assets are essential when it comes to realizing a competitive advantage through product superiority and marketing. For example, technological assets significantly enhance the performance of R&D intensive firms in US, Japan, and Europe (Belderbos, Faems, Leten, & Van Looy, 2010), R&D intensity has a positive effect on profitability in the pharmaceutical industry (De Carolis, 2003) and R&D intensity (a proxy for technological assets) has a positive impact on profitability (Kotabe, Srinivasan, & Aulakh, 2002). On the other hand, some papers also found a negative relationship between a firm's resources and its performance. For instance, having more patents was found to have a negative effect on profitability and sales in firms with high R&D spending (over US$ 10 million) in 35 industries (Artz, Norman, Hatfield, & Cardinal, 2010). Acquaah (2003) also found a negative relationship between advertising intensity, capital intensity and R&D intensity and profitability in large American firms.

Peteraf and Barney (2003) define a firm's resources as those resources and capabilities that have a significant cost-lowering or benefit-enhancing effect. For example, a firm's technological assets have a benefit-enhancing effect on the quality of the products offered to the customers. Similarly, a firm's marketing efforts also have benefit-enhancing effect in terms of opening access to markets and meeting customer needs. These resources are critical, since they potentially create a competitive advantage and allow firms to participate in product markets. Although they may require considerable investments, these resources create more economic value by providing products or services with higher perceived benefits

lower economic cost, which implies greater economic value, which in turn increases the firm's competitive advantage, which ultimately explains the differences in firm performance. Thus, we propose that the build-up of internal resources has a positive impact on firm performance.

2.2.2. External resources

Because firms usually face internal resource constraints, they need to look for additional resources elsewhere if they are to remain competitive and take advantage of new opportunities (Hitt, Ireland, Camp, & Sexton, 2001; Ireland, Hitt, & Vaidyanath, 2002). For example, they need to deliver products through distribution channels of their partners or they need to use complementary technology to create a better product. Partnerships allow firms to obtain access to tangible assets (i.e. money, technology) as well as intangible assets (i.e. reputation) that are not readily available internally. These partnerships create a distinct kind of resources that are an important source of competitive advantage.

Box 2.1. Accessing external resources from partnerships

> "The moniker FIPCo for Fully Integrated Pharmaceutical Company arose in the late 1990s. It served both to define what the largest companies in the pharmaceutical industry were—and what they were not. It was a distinction—and one that you could be proud of. FIPCos did it all: from the discovery of drug candidates, to their development, to their manufacturing, to their marketing, to their sales and delivery. Biotechs were useful; but, if their products were going to reach patients, they were either sold to a FIPCo or the biotech "grew up" into a FIPco, such as the legendary Genenthech and Amgen.
>
> At Eli Lilly & Co., all the executives understood the value of being a FIPCo and what that meant. But as a strategic intention, it fell short. It didn't differentiate Lilly from its competitors and, as the world changed, it seemed less relevant. FIPCos were relying on biotechs to source new pipeline candidates. On the other end of the spectrum, they were contracting sales forces to generate revenue. Recognizing the degree to which key strategic decisions deviated from the organizational framework of a FIPCo, Lilly coined the term FIPNet, meaning Fully Integrated Pharmaceutical Network, suggesting the merits of the integrated process but acknowledging that it could be a network, not a single corporate entity. Actually, that it *should* at some point in the future be a network—for reasons of better managing a risky business and ensuring continued advancement by attracting resources and ideas from around the world. As this notion was unpacked, it began to not only better address a changing world, but was also a source of freedom in the way organizational structures and capabilities were accessed.
>
> By the year 2006, when the term FIPNet came into corporate usage, the transformation from a "Co" to a "Net" was already underway. Lilly had realized that

> drug development efficiency was hampered by the high ratio of fixed to variable costs and had begun changing this. Lilly executives realized that they had to attract external resources and had "spun out" entities like *InnoCentive* (a crowdsourcing model for complex problem solving) and *YourEncore* (in partnership with Procter & Gamble, a consulting firm providing specialized resources for a retiree population), while creating new *internal* capabilities to orchestrate the *external* work, such as *Chorus*—which worked externally to develop clinical study designs and protocols and then orchestrated their execution by external research centers.
>
> *Taken from The Open Innovation Marketplace: Creating Value in the Challenge Driven Enterprise by Bingham and Spradlin, 2011: p.p.111-112*

The transformation of Eli Lilly from a FIPCo (Fully Integrated Pharmaceutical Company) into a FIPNet (Fully Integrated Pharmaceutical Network) (see **Box 2.1)** provides a good example of the way external resources can enhance a firm's competitiveness. In this example, Eli Lilly through its well-developed FIPNet was able to develop partnerships to access external resources, leverage its financial resources by sharing investment, risk, and reward and tapping into vast intellectual capital in different countries (Bingham & Spradin, 2011). The Eli Lilly's executives realized that external resources and internal capabilities to orchestrate its network are important to improve the efficiency of its drug development (Bingham & Spradin, 2011), thus, Eli Lilly's competitive advantage.

Further, operating in a network with partners their partners provides direct and indirect complementary resources. The NVIDIA case (**Box 2.2**) is an example of indirect complementary resources that a firm can acquire from its collaborative environment. When NVIDIA partnered with TSMC, NVIDIA benefited directly in terms of the manufacturing of its graphic processing.

In addition, NVIDIA was also able to acquire resources that were inherent in TSMC's partners. The use of TSMC's library partners provided NVIDIA with pools of technologies and gave NVIDIA free initial access to the designs from TSMC's partners, such as Artisan.

We can view a firm's position in a network as a function of its relational pattern with other partners, which indicates its potential of benefiting from a network (Gulati, 1998). Being positioned in a network, firms can have access to different levels of resources: (1) access to complementary resources, (2) knowledge and information exchanges, and (3) control and reputation. Thus, any difference in their position in the network will provide different benefits, which will in turn affect their relative competitive advantage in terms of the efficient and effective exchange of complementary resources, knowledge and control (Gnywali & Madhavan, 2001; Pillai, 2006).

Box 2.2. Direct and indirect access to complementary resources

> "As a fabless chip company, NVIDIA has outsourced fabrication of its graphic processing units to TSMC (Taiwan Semiconductor Manufacturing Company Limited) as well as other assets in such areas as assembly, quality control and assurance, and even reliability and testing. NVIDIA graphics processors are primarily fabricated by TSMC and assembled and tested by Advanced Semiconductor Engineering, ChipPAC Incorporated, and Siliconware Precision Industries Company Ltd. NVIDIA receives semiconductor products from sub-contractors, performs incoming quality assurance, and then ships them to computer equipment manufacturers, stocking representatives, motherboard manufacturers, and others. Generally, these manufacturers assemble and test the boards based on NVIDIA's design kit and test specifications, then ship the products to the retail, system integrator, or OEM markets as motherboard and add-in board solutions".
>
> "Through its relationships with TSMC and TMSC's library partners (Artisan and Virage), NVIDIA is able to improve the efficiency of its graphics processor design and fabrication by using third-party design tools and building blocks".
>
> "TMSC launched its design library in August 1998 when it signed an agreement with Artisan Components, a Silicon Valley design house. Artisan doesn't charge TSMC any fee up front, but receives royalties when TSMC produces chips using Artisan designs. In effect, TSMC customers such as NVIDIA get free initial access to the designs, marking their cash flow easier".
>
> *Source: The Keystone Advantage by Iansiti and Levien, 2004: p.p. 131 - 132*

First, firms have the incentive to collaborate with others, because the value of a product may be higher if they have access complementary technologies/products. The adoption of products or technologies is influenced by the availability of complementary products or services, or the size of the markets for the products or services in question, rather than product/service superiority (Schilling, 1998). Partnerships also strengthen supplier relations (Dyer, 1996), which are required to create a competitive advantage because they provide the resources needed to deliver end products/services. Firms with a better network position generally speaking have access to more resources and opportunities (Gulati et al., 2000), which results in a positive resource asymmetry (Gnywali & Madhavan, 2001). It also provides access to diverse resources that complement the existing resources, which will enhance the firm's scope, and reduce the costs and risks involved in the development and commercialization of the firm's resources, which in turn, enhances its competitive advantage.

Second, a network provides channels for distributing knowledge and information, which are important to fuel innovations (Tsai & Ghoshal, 1998). Firms that are in

the midst of network interactions may be allowed access to the knowledge provided by their partners and/or their partners' partners (Pillai, 2006), allowing them to learn from their partners (Kraatz, 1998), and thus accumulate and develop knowledge, allowing them to generate intellectual capital and innovation on a scale that individual firms are unable to realize on their own (Liebeskind, Oliver, Zucker, & Brewer, 1996; Mowery et al., 1996; Rosenkopf & Almeida, 2003; Rosenkopf & Schilling, 2007; Zaheer & Bell, 2005). Having a better network position can increase a firm's competitive advantage by enhancing knowledge benefits from partner diversity that provide diverse information/knowledge and early access to new information/knowledge (Burt, 1995). It can also provide a bigger and faster flow of knowledge, since firms are exposed to the information/knowledge provided through their relationships (Gnywali & Madhavan, 2001).

Third, having a better network position can also bring benefits in terms of controlling the flow of resources and information, as well as influencing the strategic moves of the firm's partners (Pillai, 2006). Firms can have a bridging position that connects disconnected clusters of partners in a network, giving them access to newer and unique information (Burt, 1995; Koka & Prescott, 2002, 2008; Rowley & Baum, 2004), allowing the firm to exert strategic actions in its own strategic interests. Firms occupying a central position will also control information in terms of having access to more information than less centralized firms (Gnywali, He, & Madhavan, 2006; Koka & Prescott, 2002, 2008). Both positions mean that a firm can exert control over the use of information and/or resources and influence other firms to achieve its own goals.

To summarize, a firm's external resources, reflected in its network position, complement its internal resources and can be a source of competitive advantage. External resources are sources of new knowledge creation that help firms overcome their resource constraints, extending the application of their resources more quickly than they could do on their own (Hagedoorn, 1995; Mitchell & Singh, 1995; Rosenkopf & Schilling, 2007). In a situation where a firm's competitive advantage is tied closely to its level of innovativeness, partnerships may be important in becoming involved in the development of cutting-edge technologies (Oliver, 1997), and gaining access to and knowledge of specific markets (Stuart, 2000). Tapping into cutting-edge technology development and market access allows firms to gain efficiency benefits from cost reduction as a result of resources and risk sharing as well as a shorter development time.

Since firms are involved in different types of relationships, their network resources will vary in quantity and quality, depending on their positions within a network. Differences in this network position lead to a heterogeneous distribution of

resources and the VRIN conditions among firms. It creates resource asymmetry between firms, creating variance in their performance. Thus, firms strive to improve their position within their network, which enables them to enjoy the benefits of exploitation of technologies and organizational practices, establish dominance in the industry through pooling and mobilizing interconnected assets, set standards, norms and dictate the direction of markets and/or technological development (Koka & Prescott, 2008). These benefits improve their competitive advantage and contribute to the variance in firm performance (Gnywali & Madhavan, 2001). Thus, since firms vary in their network positions (their external resources) in systematic ways (Gnywali et al., 2006), there will be different degrees of resource asymmetries and of the extent to which they meet the VRIN conditions. To this end, we propose that a better network position, as a reflection of a firm's external resources, can positively affect firm performance.

2.2.3. The interaction of a firm's internal and external resources

Internal and external resources complement each other in creating value. A prominent example is the case of the Sony Beta standard in video recording. Despite its technical superiority, customers preferred the VHS standard by Matsushita, because it provided customers with wide selection of VHS-compatible videotapes as the results of Matsushita's licensing partnerships (Schilling, 1998). Another example was Microsoft's operating system, which started dominating the market since it provided interoperability with many applications compared to, for example, Apple's MacIntosh system. The value of Microsoft's operating system was enhanced with different applications and hardware from Microsoft's partners, which were compatible with or supported Microsoft's operating system. In both cases, Matsushita and Microsoft appeared to realize that the value of their product did not necessarily hinge on their internal resources, but also on their external resources, in terms of the availability of a wide selection of interoperable and complementary products through their partners.

External resources can enhance the value of a firm's internal resources by providing complementary resources, knowledge, reputational and control benefits. Conversely, a firm's internal resources enhance the value of its external resources, since firms with strong internal resources will be more interesting as partners. As a result, external and internal resources can potentially produce positive synergies, which enhance a firm's competitive advantage and its performance. Zahra and Bogner (1999) reported that the success of new ventures in heterogeneous environments depends on their ability to fund and maintain their internal technological assets, while also making extensive use of external technology resources. These internal and external resources can, individually and jointly, influence a firm's performance, as found by Zaheer and Bell (2005), who

argued that a firm's innovative capabilities (i.e., dimensions of innovativeness) and its network structure (i.e., bridging position) enhance its performance (i.e., market share). Madhavan et.al (2008) found that the interaction between a firm's internal technological assets and its centrality is positively associated with its innovative performance, which means that, although external resources are necessary, a firm needs to have strong internal resources to be able benefit from those external resources, and vice versa. This finding underscores the importance of taking both external and internal resources into account to explain variance in firm performance.

Accessing external resources involves an exchange of resources between partners, which can give positive and negative effects on a firm's internal resources as a source of competitive advantage. While there are many potential advantages to operating in a collaborative environment, it may also keep firms from realizing their full potential (Oliver, 1997). Resource exchanges may include giving away the conditions that make a firm's internal resources valuable, rare, inimitable and non-substitutable (VRIN). In a resource exchange, firms open the isolating mechanism that protects the VRIN conditions of their resources, by sharing and trading those valuable resources with their partners (Lavie, 2006), risking the possibility of imitation and substitutability of their resources by their partners, which in turn makes those resources less valuable, rare, inimitable and non-substitutable (Oliver, 1997) and may, ultimately, affect their competitive advantage.

The realization of potential positive synergies depends on the characteristics of each type of resources and the fit between them. First, viewing a firm as a bundle of resources, as proposed by RBV, we can expect that firms have different degrees of complexity in terms of the relationships of their resources because of causal ambiguity inherent in those resources (Lippman & Rumelt, 1982; Reed & Defilippi, 1990). Causal ambiguity limits rivals or partners in terms of understanding the complex relationship between a firm's resources, which stems from the different paths that firms travelled in their resource accumulation. This path is unique and specific to a firm, making it is for other firms to imitate these resources. This path dependency increases a firm's competitive advantage (Dierickx & Cool, 1989; Teece et al., 1997). Second, sharing resources also creates dependency between a firm and its partners. This dependency, although risky, creates a mechanism that could protect a firm’s VRIN conditions. Since a firm depends on the other partners and invests a significant amount of resources, all parties have, therefore, common interest in protecting their own resources and the newly created competitive advantage, which depends on the competitive advantage as a result of each individual resource. Thus, each party involved in a partnership will need to respect and protect the competitive advantage of the other parties’ resources. Since they

depend on each other, trust and shared interest becomes the isolating mechanism that prevents opportunistic behaviour (Dyer & Singh, 1998; Lavie, 2006).

Third, firms may impose a protection mechanism to safeguard the VRIN conditions of their resources. Legal protection has long been an effective protection mechanism (Lavie, 2006). It enforces secrecy, which makes resources valuable and rare for a longer period (Peteraf & Barney, 2003). This kind of protection will reduce the likelihood of negative synergy between a firm's internal and external resources. In light of the arguments presented above, we propose that firms' internal and external resources can be complementary and that they have a positive synergistic effect on firm performance.

2.3. Strategic action in a business network

Firms aim to improve their performance, which means they have an incentive to exploit their resources to maximize gains from their environment, which provides opportunities and threats that influence the relationship between a firm's resources and performance. As discussed in Section 2, the relationship between a firm's resources and performance is not straightforward when competitive advantage depends on value creation in the firm's external environment. Thus, the competitive advantage inherent in the firm's resources may be enhanced, weakened or even diminished by emerging opportunities and threats in the external environment.

A firm's internal and external resources, which are valuable, rare, imperfectly imitable and non-substitutable (VRIN), are sources of competitive advantage and become important drivers of firm performance. However, possessing these resources is a necessary but not a sufficient condition for improving performance within a business network (Barney & Arikan, 2001; Priem & Butler, 2001a; Sirmon et al., 2007). It is a potential with which a firm's competitive advantage can be created through value creation. This potential can be better realized if firms respond to opportunities and threats inherent in their external environment through their strategic actions. In this way, their strategic actions are important to realize, protect and enhance the potential of their resources. We define strategic actions as a firm's realized strategy designed to realize the firm's strategic goals (Mintzberg & Waters, 1982). They are key strategic traits that manifest in a firm's responses to emerging threats and opportunities in its external environment (Venkatraman, 1989). The strategic actions that we refer to in this dissertation is, thus, about a firm's traits and decision making styles that is directed to maintain its alignment with its external environment and manage its organizational resources (Snow & Hambrick, 1980). Using this definition, we are able to capture a

firm's focus, distinguished qualities and consistency realizing its resource potential.

A firm's external environment provides opportunities that can enhance the competitive advantage of its resources. New markets, technological advancements and changing customer preferences are examples of driving forces that provide value-enhancing opportunities for firms. Firms that can respond to these emerging opportunities will increase the competitive advantage of their existing resources. In addition, a firm's external environment can create threats that can reduce or dissipate the VRIN conditions of the firm's existing resources, as a result of reduced mobility barriers that lead to a reduced degree of inimitability and control over the firm's resources (Oliver, 1997). Unless firms can protect the VRIN conditions, the competitive advantage of their resources, as produced by the RBV, will dissipate. At this point, we can see the importance of firms' strategic action as an influencing factor in the relationship between a firm's resources and performance. In the following subsections, we discuss how strategic actions influence the relationship between a firm's resources and performance.

2.3.1. Enhancing the VRIN conditions of a firm's resources

Enhancing the VRIN conditions means realization of the full potential of a firm's resources. By realizing that full potential, firms embark on entrepreneurial activities to compete with competitors or potential entrants, by seizing and shaping new opportunities and meeting customer demand better. Entrepreneurial actions allow firm to think of and act differently from their current course of action, since being entrepreneurial means being visionary (Mintzberg, Ahlstrand, & Lampel, 1998). These entrepreneurial actions are needed by firms to respond differently to changes in an environment that is not completely known or understood by firms, to realize the full potential of their resources. These acts are dominated by an active search for and shaping of new opportunities (Mintzberg et al., 1998). They allow firms to create and shape opportunities proactively, rather than passively wait for opportunities to emerge.

Enhancing the VRIN conditions is related to the creation and shaping of opportunities, which requires vision and proactive actions. Vision is needed to shape or sense directions of change in the firm's competitive environment, i.e., changing customer needs and preferences or new innovative or technological advancements. In a collaborative environment, it will also involve understanding the dynamics of network responses and structure, i.e., the emergence of new constellations or major partnerships which may bring new opportunities or threats to the firm's current position. Creating strategic partnerships, nurturing communities of partners or customers will provide benefits of information and resource sharing, producing innovations, and thus product leadership. As such,

firms that act strategically to sense changes in technological and/or market advancements will be able to introduce and align themselves to technologies/products that are likely to be better positioned in the market (Schilling, 2002). Failure to align themselves to the winning direction may make firms lose their dominance.

Enhancing the VRIN conditions is also related to seizing the opportunities mentioned above, which requires firms to maintain technology and market leadership by committing their resources to certain trajectories. Firms can choose to be early or wait before committing their resources in certain path/trajectories, to avoid a lock-in effect, which may jeopardize their chances of survival (Schilling, 2002). Firms that are able to commit their resources in time will gain more advantages than other firms, although they have the same potential value creating resources and the same value predicting information (Makadok, 2011). Firms that can act strategically in time will enhance the VRIN conditions of their resources, by creating flexibility and pre-emption benefits in their resources (Makadok, 2011). As a result, strategic actions designed to enhance the VRIN conditions has three aspects: (1) vision, (2) product leadership and (3) market leadership. Together, these will enable the firm to realize the full potential of its resources and improve its position in the market.

2.3.2. Protecting the VRIN conditions of a firm's resources

A firm's strategic actions are needed to continuously safeguard sources of competitive advantage from continuous threats in the external environment. Exchanging and sharing resources through partnerships creates risks that may violate the VRIN conditions of the firm's resources. While partnerships bring benefits, they may also have negative consequences as far as firm performance is concerned. Partnerships can create conflicts among partners that are costly to manage and that are likely to have a negative influence on the VRIN conditions of a firm's resources, and on its performance. Thus, actions need to be taken to protect the VRIN conditions of a firm's resources, which require firms to manage the efficiency benefits they can gain internally and externally. Managing efficiency involves reducing cost trough cross-cutting activities or facilitating efficient processes. In exchanging resources, efficiency can be managed by having a system that tightens communication, integration and coordination among the firm's different functional areas or partners (Henderson & Clark, 1990). Tightening partner relationships reduces maintenance cost, which improves a firm's efficiency.

While tight relationships reduce maintenance cost and improve efficiency, it can also create overembeddenes, which limits a firm's ability to enter into valuable new partnerships (Hagedoorn & Frankort, 2008). Overembeddedness happens

when the relationship between a firm and its partners becomes so tight that it makes the firm inflexible and inert (Hagedoorn & Frankort, 2008). Overembeddedness creates dependency, which may negatively influence the VRIN conditions of the firm's resources. Firms that are overembedded in a network lock themselves in a certain trajectory (Hagedoorn & Frankort, 2008; Schilling, 2002), which limits their ability to acquire new information from other networks. Consequently, overembeddedness may make a firm's resources less valuable and obsolete in time and prevent the firm from creating new value with new partners.

To respond to this situation, firms need to manage their dependency by strategically positioning themselves in their network. Positioning itself with in a network by connecting to partners that are active in different networks or different technological trajectories will increase a firm's independence and reduce the likelihood of becoming overly embedded with certain partners or networks. Being connected to different trajectories also allows a firm to tap into new opportunities that improve its position and thus its independence (Iansiti & Levien, 2004; Lavie, 2004, 2007). However, as firms need complementary resources from their partners, they need to maintain their relationships. Failure to do so will limit their access to the resources they need and is likely to reduce the VRIN conditions of their resources. This means they need to make sure to manage their dependency on partners. Partnership management, for example, guides the partnership process, ranging from the selection, coordination and integration, and dissolution of partnerships. It clarifies the partnership process and the expectation of each party involved in those partnerships.

In the RBV, isolating mechanisms act as mobility barriers, since they restrict the ability of other competitors to imitate a firm's resources (Rumelt, 1984). However, partnerships require firms to share their resources and learn from each other, as a result of which the barriers between firms are reduced, giving firms the opportunity to imitate, benchmark, or use the resources of other firms. These practices may increase their level of understanding about other firms (Oliver, 1997). As the barriers are reduced, firms become vulnerable to the discretion and expertise of others (Reagans & McEvily, 2008). Although complexity in the relationship within the resources of firms will provide a mechanism to protect against a complete imitation of any firm's resources, a firm may also create a forced mechanism to protect its resources from other the opportunistic actions of other firms.

Legal protection mechanisms may be difficult to apply in an increasingly connected environment, for two reasons: (1) the high costs of litigation and (2) the risk of damaged partnerships. For these reasons, firms usually do not choose legal mechanisms as a first option in case of potential infringements. They may to some

extent rely on the dependency nature of partnerships. The risk of opportunistic behaviours of a firm's partners may be reduced if there is a high degree of mutual dependency. Mutual dependency give rise to obligations and sanctioning behaviours, which can help prevent imitation and other kinds of opportunistic behaviour (Hagedoorn & Duysters, 2002). This, in turn, is crucial to overcome the vulnerability that is associated with exchanging resources (Reagans & McEvily, 2008). Thus, in their attempt to protect the VRIN conditions of their resources, firms may create redundant and long-lasting relationships, which are important to build mutual dependency and trust that can be maintained through shared values and a well-developed culture (Ireland et al., 2002). Firms that fail to use this mechanism will miss the chance to gain added value from sharing resources and/or lose their competitiveness due to imitation by other firms. This type of relationship nurtures the mutual interests of partners, ensuring a win-win situation and reducing the risk of opportunistic behaviour.

Finally, firms always face threats from their competitive environment in the form of constant rivalry with their competitors. This rivalry may reduce the VRIN conditions of a firm's resources if competitors are able to deliver better products and satisfy consumer preferences better. Firms can create a restraint mechanism that prevents or mitigates the negative impact of competition on product markets or prices. This can be done by creating brand loyalty and high switching cost, or by marketing horizontally differentiated products (Makadok, 2011). Furthermore, aggressive strategic actions can be taken to reduce competition through price predation or merger and acquisition. These aggressive strategic actions may be needed to protect the firm's competitive advantage. This type of mechanism will reduce the negative impact of competition and maintain or increase the VRIN conditions of a firm's resources. Although it may be a short-term solution, offering reduced prices is likely to increase the attractiveness of a firm's products, which will also protect the firm's competitive advantage.

To summarize, the four aspects discussed above (efficiency, dependency, risk and constant rivalries with competitors) can weaken the VRIN conditions that make a firm's resources a source of competitive advantage. Firms that respond strategically to those threats by imposing mechanisms to protect these VRIN conditions are likely to perform better.

2.4. Fit between the firm's strategic actions and resources and their relationship to firm performance

Resources that are valuable, rare, inimitable and non-substitutable are sources of competitive advantage, since they create heterogeneity among firms and, thus, their performance. The conditions that create a firm's competitive advantage can

dissipate due to threats in the firm's external environment. The strategic actions of firms act as mechanisms that enhance and protect the VRIN conditions of their resources and sustain their improved performance.

As found in mergers and acquisitions, integrating complementary resources is a key issue (Harrison et al., 2001). Firms that fail to take necessary actions will fail to create synergy and value (Ireland et al., 2002), which will have a negative effect on their performance. A positive relationship between a firm's resources and its performance can be expected when the firm can exert concerted actions that enhance and protect the VRIN conditions in its business network. Strategic actions influence the VRIN conditions through learning (Inkpen & Dinur, 1998; Kale, Singh, & Perlmutter, 2000), trust and shared interests (Parkhe, 1993), protection of proprietary knowledge and competitive information (Hutt, Stafford, Walker, & Reingen, 2000), flexibility (Lieberman & Montgomery, 1988) and efficiency of knowledge integration (Lorenzoni & Lipparini, 1999).

We argue that there is a synergistic effect between a firm's resources as a source of competitive advantage, and the strategic mechanisms designed to enhance and protect this source of competitive advantage (Kale et al., 2000). Although a firm's resources are sources of competitive advantage that are positively associated to firm performance, the threats and opportunities in the firm's external environment may change the magnitude or even the effect on firm performance. Threats and opportunities require firms to take concerted strategic action, which could balance the tension between different characteristics in their collaborative and competitive environments. Firms that are able to do that will be able to sustain their competitive advantage and their performance (Gnywali et al., 2006; Ireland et al., 2002). Thus, we propose that the relationship between a firm’s resources and performance will be positively influenced by its strategic actions designed to enhance and protect the VRIN condition of its resources.

2.5. Concluding Remarks

The focal question in strategic management is why firms vary in their performance. Understanding firm performance requires understanding the sources of a firm's competitive advantage and the mechanisms designed to protect and enhance that competitive advantage. Following this, we provide a conceptual framework that examines the roles of resources and strategic actions in explaining variance in firm performance. It starts with the notion that a firm is an autonomous entity operating in an environment and looking to improve its performance. As an autonomous entity, a firm possesses inherently unique resources that differentiate it from other firms. These resources, when they are valuable, rare, inimitable, and non-substitutable, become a source of competitive

advantage and firm performance. In addition, firms are also economic agents that depend on other members in a business network and require complementary resources from their partners. They also consciously act and react to threats and opportunities in their business network. These opportunities or threats, be they from collaborators or competitors, may affect a firm's competitive advantage. To this end, we propose strategic action as a mechanism to enhance and protect a firm's VRIN conditions and sustain firm performance.

2.5.1. Conclusions

The proposed conceptual framework (see Figure 2.1) adopts an integrated view to study firm performance in an environment where firms become increasingly interconnected. It combines the RBV, which predominantly looks at a firm's internal resources as a source of competitive advantage and at firms as autonomous entities, and the network perspective, which emphasizes the resources inherent in a firm's network as a source of competitive advantage. The RBV and the network perspective have already developed a theoretical logic and empirical basis that pinpoints both types of resources, their contributions to competitive advantage, and the required conditions for the creation of a firm's competitive advantage. Nevertheless, the empirical findings are mixed (Nothnagel, 2008), which may be the result of earlier studies that did not cover both internal and external resources, and the role of strategic actions. Taking in account the internal or external resources, independently from each other, is not sufficient (Zaheer & Bell, 2005). An extension is proposed to explain variance in firm performance by considering the interactions between internal and external resources and by introducing strategic actions as a mechanism to enhance and protect the VRIN conditions of a firm's resources from the opportunities and threats in its external environments.

Both the RBV and the network perspective indicate the importance of taking both the firm's internal resources and the resources that are available through partnerships with other firms into account as sources of competitive advantage (Lavie, 2006; Zaheer & Bell, 2005). We contribute to the RBV and network perspective by providing the link between internal and external resources and the influence of a firm's strategic actions on the relationship between the firm's resources and its performance. This framework also contributes to the debate about the role of a firm's strategic actions, both in the RBV (Barney & Arikan, 2001) and in the network perspective (Koka & Prescott, 2008). Strategic actions provide instruments that protect and enhance the VRIN conditions of a firm's resources from threats and opportunities in its competitive external environment (Ireland et al., 2002; Kale et al., 2000). It extends the RBV, which focuses inward and provides efficiency-related explanations, by adding an external orientation

and providing entrepreneurial explanations. A firm's resources as a source of competitive advantage create variance in firm performance, independently and in combination with the firm's strategic actions. This integration of the firm's strategic actions, as an important moderating factor in the relationship between the firm's resources and its performance, provides added value to the conceptual framework. Thus, we address the need to conceptually and empirically investigate the joint effect of two different mechanisms in creating variance in firm performance, as proposed by Makadok (2011). We expect that the causal mechanism of the RBV and the network perspective, combined with strategic actions, can also help explain variance in firm profitability.

2.5.2. Further research

The conceptual framework (see Figure 2.1) and discussions we presented above need to be supported by empirical research to shed light on variance in firm performance within networks. The direct relationship between a firm's internal or external resources and its performance is the most easily tested, since it can be done based on the abundant research in the RBV and the network perspective. The complication may be related to (1) the broad definition of a firm's resources, the identification and measurement of which may be challenging; (2) identification of samples that could isolate industrial factors, because the value of a particular resource is frequently industry-dependent (Armstrong & Shimizu, 2007). Another challenge has to do with examining the interplay between a firm's internal and external resources and their relationship to firm performance. Interaction terms among variables representing firm's resources need to be introduced. However, the interaction term may have limited usability, due to difficulties in its interpretation, especially concerning three-way interactions. We address these in Chapter 3 of this study.

Investigating and testing the role of strategic actions is complicated by the fact that there is little empirical evidence on the contingency factors that influence the relationship between a firm's resources and its performance (with a few exceptions like Koka & Prescott (2008) and Venkatraman et al. (2008)). In the end, the challenge is related to the operationalization and measurement of the strategic actions construct, which necessarily encompasses the two important aspects of (1) enhancing and (2) protecting the VRIN conditions of the firm's resources within its business network. We address this in Chapter 4, and we develop a tool to measure the strategic actions construct in Chapter 5.

3. Resources in a Business Network and Their Relationship with Firm Performance

As discussed in Chapter 2, we argue that there are two plausible explanations for low explanation power and mixed results found in previous studies with regard to the relationship between a firm's resources and performance: (1) the problem of what constitutes a firm's resources and (2) what other factors are being overlooked. In an environment that is increasingly connected, we may need to consider resources that are complementary to a firm's internal resources and made available through partnerships. In response, we asked two questions: (Q1) *What are firm resources in a business network*? and (Q2) *What is the relationship between firm resources in a business network and firm performance*?

To answer these two questions, first, we begin by discussing the research setting, i.e., the software industry, describing its characteristics and examining how they influence a firm's competitive advantage. Secondly, we conceptualize and discuss the firm's resources within a business network, in particular in the software industry. Thirdly, we hypothesize the relationship between a firm's resources and its performance. We continue with a method section, which covers the operationalization of variables and data collection. And fourth, we present and discuss the results and analyses, and finish by presenting the conclusions, limitations and suggestions for further research.

3.1. Research setting: Pre-packaged software industry

Since the conceptualization of a firm's resources and their relative importance may vary from one industry to another, we start this chapter by discussing the research setting, which is the software industry, i.e., firms in Standard Industry Classification (SIC) 7372 (pre-packaged software). This choice has to do with the fact that the software industry has certain characteristics that allow us to observe conceptualization about sources of variance in firm performance in a business network:

- High-technology industries are highly knowledge and technology intense, which is fundamental to a firm’s competitive advantage, and hence to its performance (Narasimhan et al., 2006; Schilling & Phelps, 2007). They develop complex technological products.
- Complex technological products often require a firm to engage in relationships with firms and organisations in their business network to create products, services and technologies (Iansiti & Levien, 2004; Schilling & Phelps, 2007). These relationships contain elements of

cooperation as well as competition (Bettis & Hitt, 1995; Bresnahan & Greenstein, 1999) and produce dynamic and extensive partnerships between competitors and collaborators (Rosenkopf & Schilling, 2007; Schilling & Phelps, 2007).

Because software products are technologically complex products, firms operating in this industry incur high fixed costs. At the same time, they also incur low marginal cost in their production and distribution (Kemper, 2010), which drives firms to collaborate with other firms in developing technology or marketing. In working together with others, firms try to reduce average costs, increase their economies of scale and scope, and maintain compatibility to different product platforms or hardware that will increase their customer volume.

Thus, firm performance in this kind of industry depends on how firms recognize the tension between competition and cooperation and address that tension in their resources and strategies (Bresnahan, 1998; Bresnahan & Greenstein, 1999). Thus, a network in the software industry suits our conceptualization of the sources of variance in firm performance, which is determined by internal and external resources, and the interaction between them. Including the external resources and the interaction is expected to increase the explanatory power with regard to the mixed findings.

3.1.1. Technological and product leadership

Software is an intangible knowledge-intensive product (Venkatraman et al., 2008) in which innovation/technology/knowledge creation is important to a firm's competitive advantage (Bresnahan, 1998; Bresnahan & Greenstein, 1999; Schilling & Phelps, 2007). It is a complex product where a single software product cannot fulfil all the needs of users, since they need other products to create value (Venkatraman et al., 2008). This means that interoperability and complementarity with products (hardware, peripherals, applications, etc.) is important to deliver valuable products to end consumers (Shapiro & Varian, 1998). Software products also have a short product life cycle (Lin, Lee, & Hung, 2006), which means that firms need to continuously improve and market competitive products by recombining or reusing their technological assets. The short life cycle and the virtual lack of any entry barrier means that firms operating in the software industry need to keep up with technological developments in their external environment.

Interoperability and complementarity create interdependency between complementors. Because of this interdependence and the fact that a product is valued higher for having more potential users, i.e. the network effect (e.g. Bresnahan (1998); Bresnahan & Greenstein (1999); Shapiro & Varian (1998);

Venkatraman et al. (2008), the size and growth of a firm's networks can enhance the value of a product or service (Frels, Shervani, & Srivastava, 2003). Thus, firms in the software industry also commonly enter into partnerships with different players in different industries for reasons of complementarity (Lavie, 2006; Schilling, 1998; Schilling & Phelps, 2007). A product providing a high level of complementarity and interoperability is likely to be more competitive. It allows firms to realize the full potential of their technological innovations by gaining the advantages of a network effect and capture larger market shares as quickly as possible (Schilling, 1998). In this sense, external resources are a source of competitive advantage for firms operating in the software industry. The exclusion of these external resources may contribute to the low explanatory power of a firm's internal resources.

3.1.2. Simultaneous collaboration and competition

In the software industry, technological leadership is also influenced by the availability of complementary products. Customers value a firm's innovative products more if they are complementary to other products. The more people use a product and its complementary products, the more interesting and valuable that product is. The increase in the use of a product enhances the value of complementary products, which will in turn increase the value of the initial product. This positive network effect needs to be utilized by a firm to ensure success. Consequently, firms not only compete for customers, but also for developers or firms that complement their products. Taking advantage of this effect, firms are required to access those complementary resources either through acquisitions, strategic partnerships or through an arms-length mechanism. This collaboration, along with competition, creates threats that are important in explaining variance in firm performance.

The software industry, as a part of the computing industry, is characterized by a shift from vertically integrated systems, consisting of hardware and software, to horizontal layers of different domains, i.e., peripherals, hardware, software and applications, that complement a firm's products (Bresnahan, 1998). Disintegration of this standalone system has allowed new players to operate in different layers of complementary products, which in turn has created competition among firms in each layer. While some firms disintegrate and focus on certain layers, others have maintained a tight integration between certain layers. For example, IBM offered a fully integrated and standalone system in the early 1950s and unbundled its system, using a software platform from Microsoft for its hardware, while Apple maintained a tight integration between its hardware and software platform in the 1980s (Hagiu, 2005). While firms that maintain a tight integration possess all the necessary competences, firms that operate in

separate layers may need to align their products with products from different layers to deliver valuable products to consumers. This means they have to work together with other firms to realize the potential value of their products (Hoch, Roeding, Purkert, Lindner, & Muller, 2000). The structure of the software industry and the complexity of its products may cause a firm to engage in collaboration and competition at the same time.

3.2. Firms' resources in a business network

As advocated by the Resource-based View (RBV), a firm's resources are an important determinant of its performance (Priem & Butler, 2001a). They create heterogeneity among firms and, through the VRIN (i.e., valuable, rare, inimitable and non-subtitutable) conditions, they create sustained competitive advantage, which has a positive effect on a firm's performance (Barney, 1991). There are three important characteristics of resources: (1) they are tangible and intangible assets (2) they are under a firm's control, and (3) they generate differentially greater economic value (Amit & Schoemaker, 1993; Barney, 1991; Teece et al., 1997).

As suggested by Armstrong and Shimizu (2007), the conceptualization of a firm's resources is contextual. Their value is determined by the context of the specific market in which the firm is operating (De Carolis, 2003). Although there are many other resources that also contribute to variance in firm performance, we should maintain the principle of parsimony in investigating the variance in firm performance. We chose three resources that are most important in explaining variance in firm performance in the software industry: (1) technological assets, (2) marketing assets and (3) partnerships with complementors. Technological assets and marketing assets have been regarded as two basic resources of modern firms and as a source of heterogeneity (De Carolis, 2003; Spanos & Lioukas, 2001). In addition, network-related resources have already been identified as a source of competitive advantage in the software industry (Gulati, 2007; Lavie, 2006).

Other resources that are considered important for a high technology industry include operational capabilities (Dutta, Narasimhan, & Rajiv, 1999; Li, Shang, & Slaughter, 2010) and human resources (Carmelli & Tishler, 2004; Castanias & Helfat, 2001). In the software industry, the cost of manufacturing, documenting and packaging are relatively small (Shapiro & Varian, 1998), with most expenses flowing into R&D and marketing. Human resources are important as a source of tacit knowledge, which means they are also a source of competitive advantage, but their efforts are reflected by the levels of technological and marketing assets.

3.2.1. Internal resources: Technological and marketing assets

A firm's technological assets are one of the main differentiators among firms in software industry (Lavie, 2007; Li et al., 2010; Venkatraman et al., 2008). They are valuable and unique, difficult to imitate and non-substitutable, which means they are one source of competitive advantage (Barney, 1991). Firms operating in this industry have to offer unique technological products in order to survive. This is the main source of competitive advantage and growth in the software industry.

In high-technology markets, where a firm's competitive environment is constantly changing due to new technology developments, it has already been found that technological and marketing assets are key differentiators of firm performance (Caloghirou, Protogerou, Spanos, & Papagiannakis, 2004; De Carolis, 2003). These two assets are core organizational functions that are necessary to achieve sustained competitive advantage (Krasnikov & Jayachandran, 2008; Lin et al., 2006). Technological assets are a necessary but not a sufficient element of firm success (Shin et al., 2009). They refer to a firm's endowment in relation to research and development to produce the technological knowledge, trade secrets, routines and technologies that together make up its product. Firms can create value from their innovations when they can successfully commercialize them. Marketing assets are one of a firm's main assets that contribute to a successful commercialization of its technological innovations. They refer to a firm's endowments in relation to advertising and promotions, brand image, location and marketing (Menon, Bharadwaj, Adidam, & Edison, 1999), to bring innovation to market. In an industry that is characterized by positive network effects, a firm's marketing assets are the main driver to capture value over and above any stand-alone innovation (Srivastava, Fahey, & Christensen, 2001). In addition, marketing plays an important role to assemble the right configuration of a firm's own and its partners' resources to deliver additional value through network of complementary products, through compatibility with more extensive user networks (Frels et al., 2003). Therefore, the interaction between technological and marketing assets may be an important determinant of firm performance as well (Dutta et al., 1999).

3.2.2. External resources: Centrality and structural autonomy

In the software industry, firms acknowledge that partnerships with other firms in terms of technological or market development increases their profitability (Hoch et al., 2000; PricewaterhouseCoopers, 2008). A firm's relationships with its suppliers and complementors are unique, since the existence of such relationships depends on the needs and mutual agreements of all parties involved. Firms depend on other partners in the same or different technological networks for providing them with different components or for aligning the delivery of products

to customers. Having access to complementary resources increases the value of a firm's technological innovation, which makes it possible to capture significant economic returns on investment depending on the positions in a network of partnerships. Thus, a firm's position in the network of complementors and competitors can be seen as an important part of its resources in the business network that explains the variance in firm performance in the software industry.

Two important notions that can be used to represent a firm's position in a business network are centrality and structural autonomy (Gnywali & Madhavan, 2001; Koka & Prescott, 2008). These two notions capture a firm's network resources in terms of its position relative to other firms in a network. First, centrality represents "the extent to which the focal actor occupies a strategic position in the network by virtue of being involved in many significant ties" (Wasserman & Faust, 1994). There are two factors influencing a firm's centrality: (1) the number of relationships with other organisations and (2) with whom the ties were made. The more ties firms have, the more central they are in a network. Furthermore, being connected to other highly central firms will affect a firm's centrality. If firms occupy a central position in a network, we can expect them to have access to more network resources. Second, a firm's structural autonomy captures the degree of autonomy in a network relative to other partners. Firms that develop relationships with players in different networks may bridge between different firms that would otherwise be disconnected from each other, leading to a higher level of structural autonomy. Bridging between otherwise disconnected firms allows firms to gain access to information on new technological developments, which may be valuable in shaping new opportunities.

To summarize, the internal resources of firm, the technological and marketing assets are two main sources for a firm to build its competitive advantage (Shin, Sakakibara, & Hanssens, 2008) and that may critically affect their performance (Lin et al., 2006). In addition, the external resources, e.g., the firm's centrality and structural autonomy, are fundamental to firm performance, since the software industry is characterized by network effects. Those resources compose a firm's resources in a business network. Networks may cause variance in firm performance, due to differences in the VRIN conditions of resources, compared to other firms. The variance materializes from differences in efficiency and effectiveness and different accumulation paths in the development of each resource. The process of accumulation and development is tacit and specific to a firm, which makes it difficult for other firms to capture them.

3.3. Relationships between the firm's resources in a business network and firm performance

In this section, we develop hypotheses on the relationships between a firm's internal resources (i.e. a firm's technological and marketing assets) and external resources,(i.e. a firm's centrality and structural autonomy) and the interplay between them, and firm profitability as shown in **Figure 3.1**.

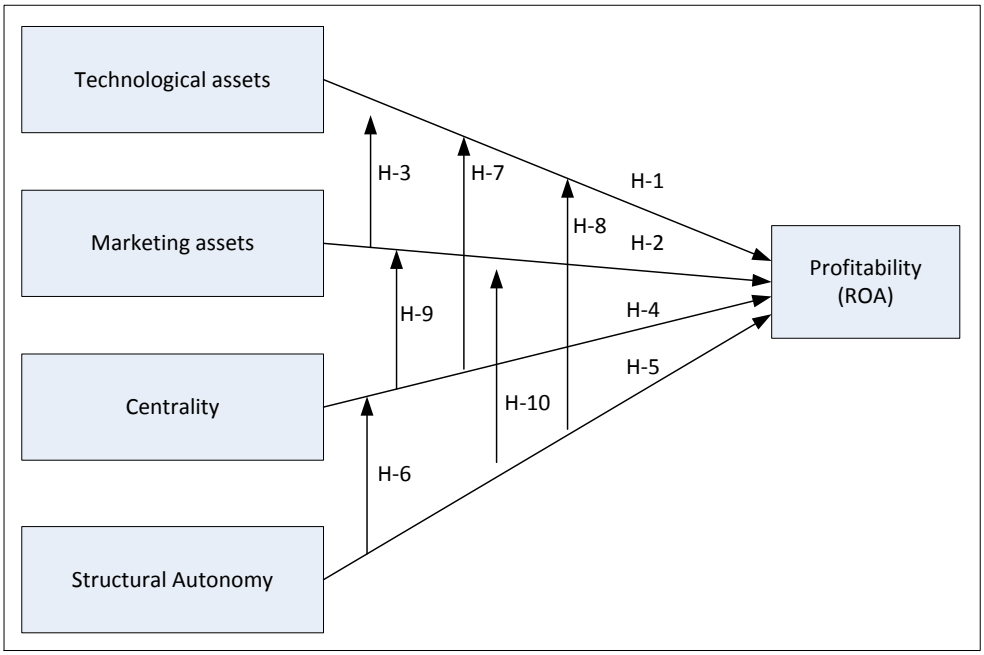

Figure 3.1. Hypotheses on the relationships between firms' internal resources, external resources and profitability

3.3.1. Internal resources: Technological assets

For software firms, technological assets are important determinants of competitive advantage (Lavie, 2007; Li et al., 2010; Venkatraman et al., 2008). They consist of technological knowledge, patents or other technology-specific intellectual capital that are valuable and difficult to imitate by competitors. Technological assets may be differentiable from those possessed by other firms, making them unique, as they stem from a firm's distinctive abilities, accumulated knowledge and learning experience, which means they cannot easily be imitated by other firms (Deeds & De Carolis, 1999). These are assets that are important to

innovation and enable firms to add value to the incoming factors of production (Spender & Grant, 1996).

Technological assets have been reported to have a significant positive effect on performance in R&D-intensive firms in the US, Japan, and Europe (Belderbos et al., 2010), R&D intensity, as a proxy to innovation or technological competence, has a positive effect on profitability (in terms of ROA) in the pharmaceutical industry (De Carolis, 2003) and in 12 different industries over seven years (Kotabe et al., 2002). In contrast to this positive association, some research also found negative or insignificant relationships between a firm's technological assets and its performance (Diaz-Diaz, Aguiar-Diaz, & Saa-Perez, 2008), for instance between R&D intensity and profitability in large American firms (Acquaah, 2003). Patents, another proxy for technological assets, have a negative relationship to profitability, in terms of ROA, and to growth, in terms of sales growth (Artz et al., 2010). DelMonte and Papagni (2003) found that four out of seven studies identified a positive effect on sales growth, especially if the sample refers to small firms, i.e., fewer than 100 employees. These findings may be related to the fact that not all patents are commercialized in the market or that patents indirectly influence performance through new product introduction (Artz et al., 2010). Moreover, in the short term, technological assets are associated with costs that may affect impact firm performance negatively, but that also may have a positive effect in the long run (Diaz-Diaz et al., 2008).

Technological assets in the software industry are associated with information asymmetry, as a technological innovation is the product of cumulative research and development activities. Most of them are proprietary in nature. They create an isolating mechanism around a firm's R&D results, to safeguard against imitation from their competitors, exclude competition and have a monopoly on the market and, thus, increase profit margins of firms (Delios & Beamish, 1999). These unique and difficult-to-imitate assets are important factors in explaining the differences in firm profitability. Firms that continuously possess superior technological assets are more likely to market competitive products than their competitors, on the basis of innovativeness and technological breakthroughs (O'Brien, 2003). This superiority will influence consumer expectations about the quality and distinctiveness of a firm's products. Increased customer expectations basically add or improve product features and qualities, allowing firms to charge a premium price, which results in higher profit margins and increased profitability (Dutta et al., 1999).

Technological assets also entail accumulated and tacit knowledge, which becomes a basis for subsequent technological developments (Cohen & Levinthal, 1990; Dosi, 1988). Because software products have relatively short product life cycles, accumulated and tacit knowledge is important in that it enables firms to quickly

develop subsequent products that satisfy customers' needs. Moreover, having more technological assets means having more accumulated knowledge, as a result of continual learning process. This accumulated body of knowledge enables firms to build on current technological assets easily and quickly, to address new opportunities that often take a long time to develop.

Although technological assets require large investments, which may reduce profitability in the short term, they increase the scope of firms and may improve firms' market capture. Increased scope provides firms with more opportunities, allowing them to develop profitable products or services. Increased scope may also indicate reusing software codes across multiple products, which reduce new product development time and costs (Venkatraman et.al, 2009). Especially in high-technology markets, such as pre-packaged software, where developments happen fast and the final product needs to interact closely with other applications and complementary products, having more technological assets may enable firms to capitalize on available opportunities quickly, which increases the chance of capturing new markets and boosts revenues and profitability. To summarize, high levels of technological assets increases the supply of high quality products in specific market and may lead to higher profit margins through price and cost advantages. Consequently, we hypothesize that:

H-1: Firms with higher levels of technological assets exhibit higher profitability

3.3.2. Internal resources: Marketing assets

A firm's marketing advantages, i.e., market access, the value of the firm's customer base and performance, stem from marketing assets. These marketing assets are an important success factor (Andras & Srinivasan, 2003; Dutta et al., 1999). Marketing assets materialize, for instance, in a firm's market knowledge, proximity to its customer base, and brand value. They are necessary to identify customer needs and understand consumer preferences (Day, 1994). Firms that invest heavily in marketing activities are more likely to have high levels of customer orientation and marketing knowledge (Griffin & Hauser, 1996; O'Brien, 2003), which are important to marketing the appropriate product. Marketing assets enhance the value of a firm's products to the customers, which potentially leads to a better product positioning (Amit & Schoemaker, 1993; Wuyts, Dutta, & Stremersch, 2004). They provide the advantage of understanding customer preferences and creating awareness of a firm's products, which in turn increases the firm's potential customer base. Through marketing activities, such as promotion and advertisement, firms are able to differentiate their products and services from their competitors and build successful brands (Kotabe et al., 2002). Thus, accumulated marketing assets are difficult to imitate or trade, as they are

firm-specific and have a high level of tacitness (Day, 1994), which means that they contribute to the firm's competitive advantage.

In the RBV and marketing literature, a firm's marketing assets are usually hypothesized to have a direct positive impact on firm performance (Day, 1994; Hunt & Morgan, 1996; Moorman & Slotegraaf, 1999). Better marketing assets reflect the possession of market channels or infrastructures, which enable firms to bring their products to their customers efficiently. However, with regard to the relationship between a firm's marketing assets and its performance, the findings are also mixed. Some researchers (Dutta et al., 1999; Singh, Faircloth, & Nejadmalayeri, 2005) have reported a positive and significant relationship, while others (Acquaah, 2003; De Carolis, 2003) have reported a lack of significance in the relationship between marketing assets and firm performance. For instance, Acquaah (2003) found a lack of significance of advertising intensity with regard to profitability in large American firms, and De Carolis (2003) also found a lack of significance between marketing competences and profitability (measured in Return on Assets (ROA). He argued that the development of marketing assets does not contribute to profitability in the short term, but it may contribute to the future value of the firm (De Carolis, 2003). This may be caused by a large portion of marketing activities being related to investment activities, such as branding and recognition of customer preferences. While those activities have a positive influence on the future value of a firm, it would appear they have little immediate impact on a firm's profitability.

Despite these insignificant or negative findings, marketing assets inherently create a competitive advantage by providing higher economic value. The accumulation of marketing assets creates efficiency in conducting marketing-related activities and improved (strong) product brands, which may increase price and people's willingness to pay, and, all things being equal, increases the firm's profit margin. Marketing assets add customer value to a product by providing new product configurations that generate new additional values, for example, through improved features (Srivastava et al., 2001). The better a firm understands its customers' preferences, the higher the profit margins will be (Day, 1994; Kohli, Jaworski & Kumar, 1993). Through their marketing assets, firms may be better able to satisfy their customers, and in in doing so increase customer value, customer satisfaction and brand loyalty. In the software market, brand loyalty is important: once a software product has earned brand loyalty, its customer base is likely to expand, which will in turn increase the popularity of the products in question and increase sales (Shapiro and Varian, 1998). A broader customer base increases a firm's revenues and is likely to boost profit. Higher levels of marketing assets provide higher margins and licensing opportunities (Singh et al., 2005), and higher revenues (Amit & Schoemaker, 1993; Dutta et al., 1999; Singh et al., 2005).

Because a software product is characterized by low variable costs, having more customers will reduce production costs, which also has a positive effect on profitability. We therefore hypothesize that:

H-2: Firms with higher levels of marketing assets exhibit higher profitability

3.3.3. Interaction between the firm's technological and marketing assets

Although many studies have identified direct effects of technological and marketing assets on firm performance, the results are partly inconclusive (Nothnagel, 2008). Lin et al. (2006) suggest that these two types of assets need to be considered simultaneously, since marketing assets can complement technological assets by exploiting their full potential (Dutta et al., 1999). Thus, technological and marketing assets are complementary, which affects firm performance in a positive way (Dutta et al., 1999; Lin et al., 2006; Teece, 1988; Vinod & Rao, 2000).

Marketing assets enable firms to understand customer preferences, telling them which technological assets to develop, and enabling them to incorporate customer preferences into their technological assets. The ability to capture and incorporate customer preferences in the firm's technological assets has a positive influence on the value of those technological assets. Thus, the two types of assets complement each other in providing assets that are valuable, rare, inimitable and difficult to trade. Marketing assets provide benefits in terms of customer and market knowledge, as a result of identifying product attributes and features that can satisfy customers (Srivastava et al., 2001), which is then translated into the firm's technological assets in complementary way (Vinod & Rao, 2000). The interaction between a firm's technological and marketing assets is shown in Figure **3.2.**

We argue that marketing and technological assets reflect a firm's abilities to balance the interest of having a long-term competitive advantage. This is in line with the fact that firms in high-technology industries need to excel at producing innovations constantly and commercializing innovations in the shape of products and services capture consumer needs and preferences (Dutta et al., 1999). Marketing assets benefit firms by exploiting the full potential of their technological assets (Lin et al., 2006), while marketing assets complement a firm's technological assets in such a way that they effectively and efficiently bring the technological assets to the customers. Marketing activities can only help improve firm performance if a firm has strong product offerings. The interaction between marketing assets and technological assets actually helps improve firm performance (Dutta et al., 1999). Marketing assets also enable firms to recognize new segments or areas of growth for their technological assets. The sales force

has become the frontier in detecting changing customer preferences or new technological developments. Thus, marketing assets enhance a firm's ability to generate technologies that can be applied in different industry domains, by providing specific information about emerging customer needs (Dutta et al., 1999). In this way, firms could efficiently, i.e., more quickly and less costly, produce new or better product offerings that help satisfy consumer preferences and increase product profitability.

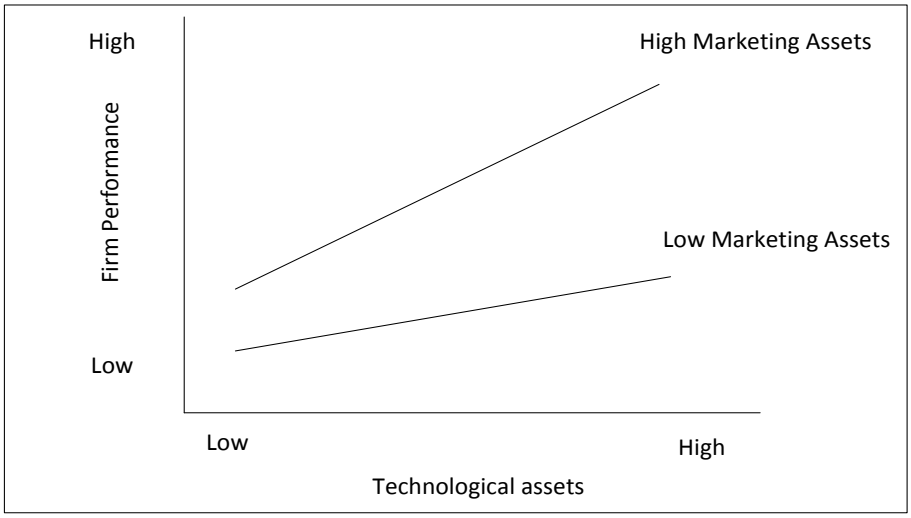

Figure 3.2. Hypothesized interaction effect of firm's technological and marketing assets on firm performance

Software products are characterized by high investment costs and low variable cost (Kemper, 2010). With this type of cost structure, the high investment costs of producing technological assets can be overcome by a large customer base, which reduces the production costs of a software product. Additional users as a result of a firm's marketing efforts reduce the production cost of a software product, and thus increase profitability. This means that the combination of marketing and technological assets allows firms to enhance their profitability through premium pricing and superior products (Kotabe et al., 2002) and through a reduction of production costs by expanding the customer base (Kemper, 2010; Shapiro & Varian, 1998), which is why we hypothesize that:

H-3: Firms with higher levels of technological assets together with higher levels of marketing assets will exhibit higher profitability

3.3.4. External resources: Centrality

The first benefit from partnerships is access to more and better resources, through a firm's central position in a network, which means that a firm has a large number of partnerships and a high intensity in its partnerships, allowing the firm to access the resources of its partners and use them for its strategic goals. Occupying a central position provides access to better and more resources and opportunities (Gulati et al., 2000; Mitchell & Singh, 1995). It means that firms in a network have a positive resource asymmetry by having a more central position (Gnywali & Madhavan, 2001). These advantages are the result of a higher volume and speed of information, as well as more resource flows, which are important in keeping a firm's resources valuable, rare and difficult to imitate or substitute. This does not mean that firms need to develop relations with many firms, but that they need to develop relations with partners that could maximize access to resources, while minimizing the costs involved in maintaining the relationships (Venkatraman et al., 2008).

Firms that occupy a central position in the network have access to more resources than other firms in the network, and they can select key resources that are available because of their direct contact with multiple partners (Koka & Prescott, 2008). The same is true with regard to the volume and speed of assets, information and status flows (Gnywali & Madhavan, 2001). Firms that occupy a central position also have a high intensity of relationships, reflecting resource commitment. This increases the quality of exchanges between partners, due to interactions frequency (Koka & Prescott, 2008). In short, the central actor generally has access to better and more resources and opportunities (Gulati et al., 2000; Mitchell & Singh, 1995). In addition, resources are located at a shorter "distance" to well-connected firms, which means they are available more quickly and cost-effectively, which in turn increases profitability.

While having more partnerships improves a firm's centrality, it may have a negative influence on firm performance, due to the costs and time associated with managing a large number of partnerships (Lee et al., 2010). However, a central position increases the visibility of a firm's product offerings and reduces the uncertainty of product performance, which is needed to engage existing and potential customers. This is likely to outweigh the costs of being engaged with many partners. Especially in the software industry, these costs may be outweighed by potential efficiency gains from resource sharing and creating a broader customer base. Sharing resources means that firms can use the resources provided by their partners, which they would otherwise have to develop themselves at much higher costs (Ahuja, 2000). Having a broader customer base also reduces production costs and will increase profitability.

The availability of complementary products, e.g., hardware, applications and services, certainly increases the likelihood of having a broader customer base. Firms that occupy central position will enjoy the benefits of being connected to many complementary resources, which increases the attractiveness and popularity of their products. Other firms will likely try to connect to these companies, to increase their popularity by being compatible with certain operating systems and tapping into their customer base. Having a broader customer base also increases a firm's prominence and customer trust, which may improve their bargaining power (Koka & Prescott, 2008), which in turn may result in efficiency of resource utilization. In addition, having a prominent position enables firms to establish standards and norms that are in line with their strategic interests (Koka & Prescott, 2008). It also helps firms to make sure that their partners are better aligned to their own interest. In this way, a centrally positioned firm uses its prominence and the associated bargaining position to control and gain access to better resources (e.g. better price and quality), which will enhance efficiency, reduce costs and increase profitability. The benefits of having access to better and more resources, cost efficiency, prominence and bargaining power lead to the following hypothesis:

H-4: Firms that are more centralized will exhibit higher profitability

3.3.5. External resources: Structural autonomy

The second benefit that firms can obtain is access to diverse and unique information/resources, which can be captured by taking up a bridging position in a network, i.e., structural autonomy. Structural autonomy represents a firm's properties that reflect potential benefits to a firm as a result of having a position in which "an actor has structural holes between the actors it is connected to but is free of structural holes in its own end" (Gnywali et al., 2006). These firm level properties indicate the potential from having a position that connects different "sub-networks", in other words a bridging position (Gnywali & Madhavan, 2001). As shown in Figure **3.3.**, firm A has a higher level of structural autonomy than firm B. It bridges different sub-networks though its partnership with firm B. This position provides firm A with access to diverse and unique information when connecting two separate networks. Firms in this position can connect different partners that are otherwise unconnected (Venkatraman et al., 2008), increasing the likelihood that they are exposed to novel information (Burt, 1995). They have access to diverse information, and control the information between the networks, giving them a temporal advantage of being able to exploit that information before others do. As such, they are in a position to select information that is valuable and rare.

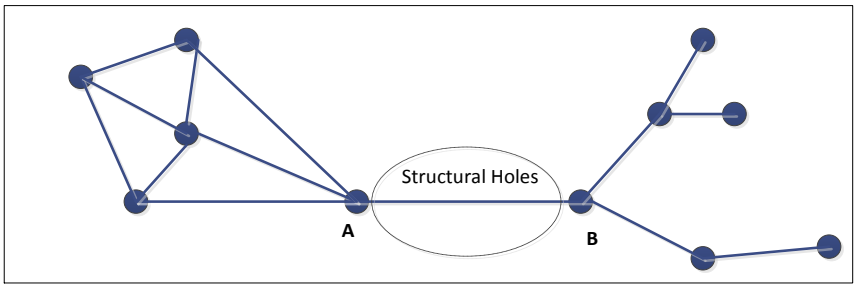

Figure 3.3. Illustration of firms' structural holes

In the software industry, which spans different domains, quick access to information is essential to stay up-to-date with regard to new developments in the firm's external environment. Firms develop different types of relationships to reap the benefits of occupying a structurally autonomous position that maximizes non-redundant partners by bridging unconnected partners (Burt, 1995). When bridging unconnected partners, it will likely provide access to different market domains, hence, provide control advantage that allows firms to exploit information on either side of the bridge (Zaheer & Bell, 2005). In addition, bridging different market domains provides firms with access to knowledge areas that are difficult to reach (Reagans & McEvily, 2003). Firms occupying this position enjoy the benefits of information leakages in different market domains, which may enhance innovation, and thereby firm performance (Rowley, Behrens, & Krackhardt, 2000). It means that a firm has less redundancy, which increases the potential scope of a network, as well as the diversity of information it has access to (Capaldo, 2007). It also increases a firm's potential to generate innovation by accessing novel information and exploit that information to its advantage (Burt, 1995). It provides enhanced information benefits through access to a diversity of partners, earlier access to new information and inclusion in more interactions (Burt, 1995).

In the software industry, where software products need other products to work properly, this position also allows firms to connect with partners to access complementary products. Software products require interoperability between hardware, software and communication components (Venkatraman, 2008). There are firms that develop software, for instance operating software, that bridge these three domains, which allows them to connect firms from different segments of the computing industry or other industries, which increases their potential to generate new innovative products by accessing novel information and exploiting that information to their advantage (Burt, 1995). Having access to novel and diverse information may improve the quality of a firm's product offerings, making it possible to charge a premium and thus increase profit margins. Moreover, it

provides firms with advantages in terms of more effective and efficient flows of resources (Gnywali & Madhavan, 2001), which is likely to reduce the costs and time associated with internal learning and development (Gulati, 2007), and increase profitability. We therefore hypothesize:

H-5: Firms with higher levels of structural autonomy will exhibit higher profitability

3.3.6. Interaction between centrality and structural autonomy

As discussed above, occupying a central position and having structural autonomy are sources of competitive advantage. Although each position contributes to firm performance independently, the interaction between the two positions may also affect firm performance. Although the effects of centrality and structural autonomy have been investigated by many researchers, that is not the case when it comes to their joint impact on firm performance (Koka & Prescott, 2008). Koka and Prescott (2008) found a negative effect on firm performance if firms score high on both aspects (central position and structural autonomy). Departing from the logic of resource limitation assumed by March (1991), Koka and Prescott (2008) have suggested that firms have to make a trade-off between what position they want to occupy, since they are unlikely to score well on both aspects.

By contrast, firms operating in the software industry can simultaneously pursue two types of partnerships (Lavie & Rosenkopf, 2006), which results in high levels of centrality and structural autonomy. The first type consists of numerous and intense partnerships with other central partners that firms engage in to maintain product compatibility and secure access to their partners' customer base. A main player in enterprise software solutions, such as SAP or Oracle, may have intensive partnerships with other main players in operating system software, such as Microsoft, in the form of R&D activities, in order to maintain compatibility and interoperability. Such a partnership may increase the firm's centrality. The second type consists of partnerships that connect the firm to other firms in different industries, for example by providing services to small and medium-sized enterprises as well as customers and partners, covering a wide range of vertical industries with its applications. This means that the firm in question occupies a bridging position between different industry domains, which boosts its structural autonomy.

In this way, structural autonomy and centrality can coexist, because firms can create partnerships with different partners in multiple domains that increase density as well as variety (Gupta, Smith, & Shalley, 2006). The two kinds of partnerships bring two separate benefits for firms and the relationship between them depends very much on whether the two compete for scarce resources and

on the context (Gupta et al., 2006). Firms can develop a loose network that bridges their product domain with networks in other product domains. The number and intensity of the partnerships will affects a firm's central position and having partners in different networks will increase a firm's structural autonomy. In this sense, these two aspects can be realized at the same time, since different types of partnerships and resources are involved, and the number of interfirm partnerships has no clearly defined limit (Gupta et al., 2006). Having high scores on both aspects may indicate that a firm is able to maintain these two positions, because it benefits from exploring new technologies with its technological partners, as well as exploiting the complementary assets from partners across the value chains. A firm's ability to develop long-term and repeated partnerships, exploiting their complementary assets with other firms, which increases the firm's centrality, does not hinder the firm's ability to develop new partnerships to explore new technologies in different technological domains, which increases its structural autonomy.

The software industry is characterized by high level partnerships across different domains, such as production, marketing, sales and services. These partnerships can help a firm to overcome its resource limitations through resource-sharing, and balance the tension between centrality and structural autonomy, by focusing on different domains (Gupta et al., 2006). For example, SAP's products are connected to customers in different industries, such as banking, healthcare and manufacturing. It allows firms to use both abilities and engage in exploration in one domain, and in exploitation in another domain. Firms in the software industry have a short product life cycle, which requires them to continually pursue an exploration-oriented strategy, to continue their product leadership through technology and product development. Simultaneously, these technology and product developments can be exploited through a firm's existing infrastructures, i.e., partnerships along its value chain, or existing products can be exploited in the form of applications in different markets or industrial sectors. SAP has engaged in partnerships to explore new product or technology developments, but it also exploits its existing products or technology to create value by making them available to clients in different sectors (e.g., healthcare, manufacturing, banking) and market segments (e.g., SMEs or a global market).

Based on the discussion presented above, we argue that having a high score on both aspects is possible since pressures of resource limitation may not conflict across technological and firm boundaries (Lavie & Rosenkopf, 2006). Resource limitation is overcome by the fact that firms can access complementary assets and use existing resources to simultaneously maintain a high level of centrality and structural autonomy. In this sense, the relationship between a firm's centrality and structural autonomy can be hypothesized as has been done in **Figure 3.4**.

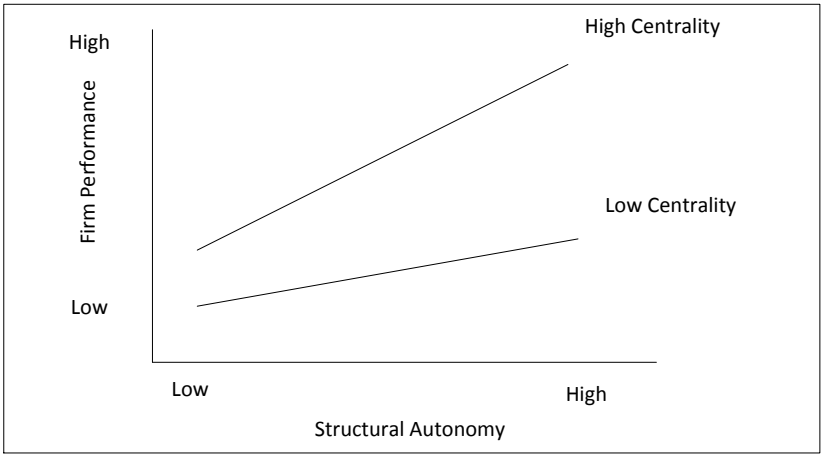

Figure 3.4. Hypothesized interaction effect of firm's centrality and structural autonomy on firm performance

Both positions provide different benefits in terms of external resources, enabling firms to leverage different types of benefits, which enhance their performance. Efficiency benefits can be achieved from more partnerships, allowing firms access to more shared resources, from higher partnership intensity, allowing firms to develop trust among partners, and also from shorter and faster access to diverse partners. Thus, centrality creates efficiency benefits by providing alignment between a firm's resources and product portfolios, and complementary resources or products, while structural autonomy creates efficiency by accessing new and diverse resources from a resource-rich network (Venkatraman et al., 2008). A centrally located firm creates a mass market of users through its partnerships with complementary firms, which may create increasing lock-in effects (Lee, 2007). Occupying a structurally autonomous position provides access to an efficient resource-rich network that reduces the time needed to enter new markets (Lee, 2007). These efficient resource-rich benefits, the likelihood of a lock-in effect and reduced time-to-entry will reinforce each other, maintaining current customers and capturing new customers which is likely to enhance a firm's revenues and reduce its costs, and thus increase its profitability. Consequently, we hypothesize the following:

H-6 : Firms with higher levels of centrality together with higher levels of structural autonomy will exhibit higher levels of profitability

3.3.7. Interaction between internal and external resources

A network partly reflects the result of a firm's continuous efforts to gain access to diverse pools of resources, i.e., technological and marketing assets. External

technological assets can only be acquired through partnerships with other firms, for example through licensing or other technological agreements. Moreover, external marketing assets can be acquired through supply agreements or other marketing agreements. Having higher levels of centrality and structural autonomy will help a firm to get a return from its internal resources. Firms can access complementary resources from their partners and they are better informed about new threats and opportunities in their own market or related markets, allowing them to fine-tune and adapt their resources and product portfolios (Lee, 2007; Venkatraman et al., 2008). Likewise, firms need better internal resources to benefit more from their external resources (Lee et al., 2001). While better internal resources play an important role in attracting external resources, they are also important in internalizing the benefits of those external resources.

3.3.7.1. Technological assets and external resources

In the software industry, possessing technological assets and building complementary assets are an important source of competitive advantage. A firm's technological advancement is the result of its internal technological assets on the one hand, and the acquisition and application of external technological assets/innovations (Deeds & De Carolis, 1999; Zahra & Bogner, 1999). In order to benefit from compatibility and extensive customer networks, firms build complementary technological assets around their own technological assets. Being centrally positioned enables firms to create such compatibility and complementarity, which enhances the value of their technological assets. The efficiency comes from having complementary technological assets from multiple partners, allowing firms to share the costs and risks associated with developing the assets themselves. It also reduces development time, which means that a product/service can be offered more quickly to respond to emerging opportunities, which increases a firm's competitive advantage. The efficiency benefits from having a higher level of centrality reduce the costs associated with technological asset development, and increase profit margins and profitability. In addition, having greater access to different resources, i.e., complementary assets from multiple partners, is more likely to increase the competitive advantage of internal technological assets, which increases a firm's revenues and profitability. We hypothesize that:

H-7: ***Firms with higher levels of technological assets together with higher levels of centrality will exhibit higher profitability***

In addition to reaping the benefits of occupying a central position in terms of their technological assets, firms can also benefit from their structural autonomy. Structurally autonomous firms enhance the value of their technological assets with diverse and non-redundant information/knowledge (Zaheer & Bell, 2005).

Firms that bridge different networks increase the complementarity of their technological assets. Diverse information and knowledge will complement a firm's technological assets and may increase the market scope of their technological assets. In a market characterized by strong positive network effects, innovators are encouraged to capture market share as quickly as possible, so that their products can become industry standards. The faster a firm identifies opportunities to align its product, the greater the potential the network effect.

Moreover, benefits also come from cost efficiency of having non-redundant partners. Connecting to partners who are strategically positioned in different market domains will reduce the costs of developing and maintaining relationships, while still providing access to the resources inherent in the network. Efficiency also comes from the timing benefits, which promote a quick development of a firm's technological assets (Zaheer & Bell, 2005).

Firms that possess many technological assets and that are structurally autonomous in their network will be able to access novel and unique information from their partners (Burt, 1995; Powell, Koput, & Smith-Doerr, 1996; Zaheer & Bell, 2005). This increases the quality of innovation, and reduces the time and search costs involved in looking for new information/knowledge. The better the information/knowledge is, the better a firm's technological assets will be, which increases profitability. We hypothesize that:

H.8: ***Firms with higher levels of technological assets together with higher levels of structural autonomy will exhibit higher profitability***

3.3.7.2. Marketing assets and external resources

The main function of marketing is to identify and capture the opportunities and value that originate and exist in the marketplace. Firms can enhance the positive contribution of their marketing assets by accessing resources that are available within their network and that provide them with new opportunities to generate new resources. Being partners with multiple firms increases a firm's marketing assets, making it possible to create additional value through networked complementary products, or through compatibility, via more extensive user networks (Frels et al., 2003). The extent to which the positive contribution of marketing assets can be enhanced depends on a firm's position within its network, since each position brings different benefits.

Firms occupying a central position in the network can capture the assets required to generate and capture opportunities from multiple partners that complement their internal marketing assets. Being connected to multiple partners increases a firm's visibility and thus its prominence, improving its brand, reputation which is an important indicator of quality (Keller, 1993) and a potential barrier against

competition. The quantity, quality and prominence benefits of being in a centralized position will have a positive influence on a firm's marketing assets. Centrally positioned firms tend to be connected to competitive partners (Gulati, 1998; Powell et al., 1996), which enables them to perform their marketing activities efficiently and improve their visibility. Furthermore, close proximity to other firms with similar interests improves the exchange of information and improves trust, allowing firms to enhance the alignment of their marketing assets with their partners, which benefits both the firms in question and their partners (Gulati, 1998; Powell et al., 1996).

Having access to complementary assets from their partners means that firms can overcome the limits of their internal marketing assets by gaining faster access to a new markets, which is less costly than developing them on their own. Developing markets in new areas or segments is likely to be more successful with partners, since partners understand their market and segments better than the firms themselves. The positive interaction is the result of from having a better and faster understanding about new potential markets and the quality of a firm's marketing assets in terms of learning and internalizing this information. The likelihood of increased quantity and quality of information as a result of occupying a more centralized position in a network, and the quality of learning and understanding the needs of customers, allows firms to improve the level to which they retain existing customers and capture new customers. Thus, efficiency benefits can be realized by using the existing infrastructures of their partners and their partners' partners, which increases profitability. We hypothesize that:

H-9: ***Firms with a higher level of marketing assets together with a higher level of centrality will exhibit higher profitability***

Firms that possess a high level of marketing asset and are structurally autonomous within their network will be able to recognize emerging threats and opportunities quickly (Burt, 1995; Powell et al., 1996; Zaheer & Bell, 2005). Structurally autonomous firms can reap the rewards of having access to diverse and non-redundant information/knowledge. These diverse and non-redundant resources are a driver of new business opportunities, which could materialize when firms are able to align their internal resources with those of their partners. This implies that they have access to a rich and unique set of complementary resources (Gnywali & Madhavan, 2001), which allows them to expand the base of interoperability of their products. Strong marketing assets enhance these benefits by providing a better understanding of the needs and preferences of customers. Strong marketing assets, reflected in a strong brand value, also positively interact with being connected to firms in different segments. This increases a firm's visibility, which in turn increases product awareness. Increased product awareness and

interoperability with other products is likely to reduce customer anxiety with regard to new products, and increase the potential customer base. The higher the quality of marketing assets, the better a firm will be able to consolidate the information about relevant threats and opportunities, allowing it to respond efficiently and increase profitability. We hypothesize that:

H-10: ***Firms with a higher level of marketing assets, together with a higher level of structural autonomy, will exhibit higher profitability***

In all, we have proposed ten hypotheses to investigate the relationship between a firm's resources and its performance. In the following sections, we further operationalize these hypotheses and test them with a data set consisting of data from samples in software industry.

3.4. Methods

3.4.1. Research context

We selected firms operating in the pre-packaged software industry (firms with SIC 7372) to study the relationships between the resources and performance of firms. The software industry has relatively low entry barriers, causing intense technology competition. Since the industry is characterized by network effects and maturity, it is highly concentrated in a small number of firms that benefit from being the first in the industry. In addition, the products involved are highly complex, consisting of interrelated technologies, which mean that almost no firm has all the capabilities to create value for end customers efficiently and effectively.

The firms in this research context primarily engage in the design, development and production of pre-packaged computer software. Their products include operating, utility and application programs, as well as services like the preparation of software documentation, the installation of software and the training of users in the use of the software. Customers in this industry range from individual customers, small and medium-sized organizations, enterprises, government institutions, educational institutions, Internet service providers, application developers and original equipment manufacturers (OEMs). The software industry is characterized by a small number of big players, including Microsoft, Oracle and SAP, with a global market share of about 17.5%, 5.90% and 6.60%, respectively, in 2007 (Datamonitor, 2008). Although several players are able to operate in a diverse range of market segments or industry sectors, almost no firm has all the competences (Rosenkopf & Schilling, 2007; Schilling & Phelps, 2007).

The choice of a single industry as our research context may help us take a closer look at the variance in firm performance. However, it will also limit the research

generalizability, which means that the results can only apply to firms that have similar characteristics to the firms operating in the software industry.

3.4.2. Data sources and collection

For the empirical investigation, financial data and network-related data were collected and checked among a variety of databases (COMPUSTAT global, Thomson's SDC Platinum, Market Insights and Edgar Database). We collected financial data from the COMPUSTAT global database which provides financial information on firm performance and internal resources. Compustat Global standardizes financial reports by a financial statement, preparing information that is comparable across firms, industries and time periods. Firms often present their financial results in a variety of formats, making it difficult to construct parallel firm comparisons (Compustat, 2011).

To draw samples from business networks, we followed the rules used by Schilling and Phelps (2007) to construct business networks as whole networks. A network relation is defined as the formal agreement created by a firm. We use Thomson's SDC Platinum database to generate a sample of partnerships. It provides archival information on strategic agreements between firms, covering marketing, supply, R&D and manufacturing agreements. This database has long been used in several studies (e.g. (Anand & Khanna, 2000; Bae & Gargiulo, 2004; Schilling & Phelps, 2007)) since it provides the required features for our analysis, as follows:

- The database uses a wide range of sources for its data collection, i.e., SEC filings and their international counterparts, trade publications, wires and news sources (Anand & Khanna, 2000; Schilling & Phelps, 2007). Also, SDC Platinum shows reliable patterns of interfirm relationships (Schilling, 2009), which is important to generate a representative business network. SDC Platinum, as any other database, has a bias toward firms in North America and English-written sources.

- It includes different types of agreements, i.e., joint ventures, R&D, technology transfer, manufacturing, marketing, licensing, Original Equipment Manufacture (OEM), value added reseller and supply agreements (Lavie, 2004, 2006; Schilling & Phelps, 2007). It also includes agreements between firms and any other types of organizations, such as government organization and universities (Schilling & Phelps, 2007). This feature allows us to take the strength of each agreement into account and calculate centrality and structural autonomy.

- It includes extensive information on descriptive data of firms (name, SIC code, the Venture Economics Industry Codes (VEIC), ticker of a firm and its parent company).

To generate samples, we used the following rules. We included agreements in which at least one of the participants was a firm with SIC 7372 and/or where agreements were coded with SIC 7372. We also used a conventional rule of a five-year time window to make sure we captured active alliances, whose life spans generally speaking do not transcend five years (Gulati & Gargiulo, 1999; Lavie, 2004; Stuart, 2000). Thus, we collected agreements that were announced between 2003 and 2007. The resulting data set includes 4802 firms, involved in 6033 agreements.

Before using the data, we conducted some data cleaning, as suggested by Anand and Khanna (2000). Firstly, we removed inconsistencies, double entries and recoded undisclosed participants to avoid false hubs. Secondly, we checked the firm's status in relation to different events, such as name changes, acquisitions, liquidation/bankruptcy or merger. The Market Insights database was used to check the firms' status. This database provides data on company profiles and the company history of active and inactive companies. However, the Market Insights database is only suitable for public companies, which make up about 20 % of the companies in the network data, which meant we had to verify the status of the remaining companies via an Internet search for individual firms. To incorporate the different types of agreements, we weighted each type of agreement. We followed the rules used by several researchers (Gulati & Gargiulo, 1999; Koka & Prescott, 2008), basically assigning a numerical score to each type of agreement. This score reflects the intensity of cooperation and interdependence, which indicate the potential quantity and quality of network resources associated with each type of agreement (Koka & Prescott, 2008).

3.4.3. Research samples

Focusing on a single industry, i.e., the software industry, allows us to control for industry-specific factors (Li et al., 2010). One can argue about the importance of industry factors influencing the model, but, by focusing on one industry, these cross-industry factors can be excluded. All firms operate in the same industry and have experienced the same events, such as economic crises, industrial contraction, fierce competition as a result of low entry barriers, and network effects, causing market concentration.

We use SIC 7372 to categorize firms that operate in the software industry. The structure of the network of firms in this category itself shows inequality of variance among firms in a network, as shown by the network centralization, which measures the degree to which an entire whole network is focused around a few central nodes (Scott, 1991). From the analysis using social network analysis, UCINET 6, we found that the network centralization of our network is 0.51, which means that there is a substantial level of concentration in our network and the

centrality of the various firms varies substantially (Hanneman & Riddle, 2005). It also indicates that our network is concentrated around a small number of centralized firms (Scott, 1991), which is indeed the case in the software industry, where networks are sparsely connected but efficient (Iyer, Lee, & Venkatraman, 2006). The firms at the core of this network are mainly public firms (i.e., publicly listed at stock exchanges). Specifically, the pre-packaged software market is concentrated around a limited number of publicly listed firms (Datamonitor, 2008; OECD, 2008), which is why we focus on these firms, since the amount of information available is much higher for these firms than for private firms.

Our samples were further drawn based on the following criteria: (1) the firms are active in the pre-packaged software industry (i.e. SIC 7372); (2) they are active during the observation point; (3) financial data are available; (4) they are publicly traded; and (5) they are found in the network data. The firms in the sample were selected by matching network data and financial data. Because financial information is only available for publicly listed firms, we gathered samples of publicly listed firms for subsequent data collection. We collected financial data from COMPUSTAT Global. We generated firms with SIC 7372. In 2007, there were 373 public firms with SIC 7372. We matched these firms with the network data, which resulted in 171 firms. We checked missing data for each case and tried to complete it by checking the annual reports, both in the Edgar Database and on the firms' websites. The match gave us 171 cases and a complete list (of cases where all the variables are complete), leaving us with a total sample of 96 cases. This can be considered representative, since the sample contains 56% of the population of firms (171 cases) that (1) existed in 2007, (2) are publicly listed with SIC 7372, (3) are part of a business network in the software industry.

3.4.4. The model

In order to analyze the hypotheses regarding the relationship between a firm's resources and performance, we conducted an OLS regression and used a hierarchical method (Jaccard & Turrisi, 2003). Using a hierarchical method enabled us to examine the predictability of each variable that we hypothesized (Jaccard & Turrisi, 2003). Firstly, we examined whether any significant relationship between a firm's internal resources and performance, and introduced the interaction between the two variables constituting a firm's internal resources. Secondly, we examined whether there is any significant relationship between a firm's external resources and its performance, and introduced the interaction between the two variables constituting a firm's external resources. Thirdly, we introduced the interaction effect of a firm's internal and external resources. The complete model, including all main and interaction effects, is as follows:

$$V = \beta_0 + \beta_1\, Emp + \beta_2\, Tech + \beta_3\, Mark + \beta_4\, Auto + \beta_5\, Cent$$
$$+ \beta_6\, Tech * Mark + \beta_7\, Cent * Auto + \beta_8\, Tech * Cent$$
$$+ \beta_9\, Tech * Auto + \beta_{10}\, Mark * Cent + \beta_{11}\, Mark * Auto + \varepsilon$$

where :

V	=	Firm Performance
Emp	=	Firm size
Tech	=	Technological assets
Mark	=	Marketing assets
Cent	=	Centrality
Auto	=	Structural autonomy
ε	=	Error term

Firm performance is measured by return on assets (ROA). The number of employees is used as a control variable of firm size. We used technological assets and marketing assets to represent the firm's internal resources. Moreover, we used centrality and structural autonomy to represent the firm's external resources. To examine interaction terms, we mean-centered the independent variables before forming the interaction terms to reduce multicollinearity and ease the interpretation of coefficients (Aiken & West, 1991). Each of the measures is discussed in the following sub-sections.

We chose an industry with a short life cycle, to control for time lag effects. Although our study was designed as a cross-sectional study, causality inference in this model can be inferred from the availability of substantial background information and clear knowledge about temporal priority in terms of the relationship between resources and firm performance (Wunsch, Russo, & Mouchart, 2010). For example, the CEO of a firm usually states, in the firm's annual report or letter to stockholders, that improvement of the firm's performance can be attributed to its resources or significant changes in the reported year, which means that resources are considered a determinant of firm performance. In addition, the primary aim of this chapter is to uncover the relationship between the firm's resources and performance. In the RBV, which we use in this research, a firm's resources have been theoretically developed and empirically tested as the causal factors of firm performance (Barney, 1991; Lavie, 2006). Therefore, the opposite relationship (reverse causality), the notion that firm performance can influence a firm's resources falls outside of the scope of this research.

3.4.4.1. Firm Performance

The RBV describes the relationship between resources and sustained competitive advantage. We chose to investigate differences in firm performance rather than sustained competitive advantage, since competitive advantage is a difficult construct to measure (Ketchen, Hult, & Slater, 2007) and appropriate measures of competitive advantage are rare (Nothnagel, 2008). Barney (1991) suggested that superior performance is achieved through sustained competitive advantage. Competitive advantage reflects the ability of a firm to generate more economic value than its competitors. The consequences are visible in the firm's financial performance, since having a competitive advantage over its competitors lead to "superior financial returns within its industry over the long run" (Ghemawat & Rivkin, 1999). Thus, competitive advantage is a mechanism that produces variance in firm performance.

Profitability is one important indicator of firm performance (Steffens, Davidsson, & Fitzsimmons, 2009; Venkatraman & Ramanujam, 1986). It is a measure of firm performance that reflects a firm's goal in generating economic rents from its business activities (Amit & Schoemaker, 1993). It is a likely indication of competitive advantage, reflecting the firm's ability to effectively and efficiently transform its resources into product market offerings with superior economic value and higher profitability than its competitors.

Profitability is measured using Return on Assets (ROA) to maintain (1) consistency with previous research investigating the relationship between firm resources and profitability, and (2) a close connection to managerial decision variables. We used a three-year average (of 2005, 2006 and 2007) to address the persistence of firm performance, as suggested by several researchers (Farjoun, 1998; Khatri, 2000; Robins & Wiersema, 1995). We defined profitability as a ratio of net income divided by total assets, which has been widely used in strategic management studies (Brush & Bromiley, 1997; Roquebert, Phillips, & Westfall, 1996; Rumelt, 1991; Short, Ketchen, & Bennett, 2006).

$$ROA_3 = \frac{1}{3}\sum_{t=1}^{3}\frac{NetIncome_t}{TotalAssets_t}$$

3.4.4.2. Technological assets

Similarly, in order to maintain consistency with previous research, technological and marketing assets were measured by measuring of R&D and marketing intensity, respectively (Delios & Beamish, 1999; Kogut & Chang, 1991; Lin et al., 2006). As technological assets are the product of a firm's R&D activities, they can

be approached by the propensity of investments in R&D activities, using a ratio of the firm's R&D expenses divided by its revenues.

$$R\&D_{intensity} = R\&D_{expenses}/Revenue_{total}$$

A higher commitment to R&D results in the production of new knowledge that is necessary for the creation of new competitive products (Cohen & Levinthal, 1990). The expenditures on R&D have long been used as an indicator of innovative activity in many industries (Artz et al., 2010), which are critical to create new products or technologies. It is expected to affect innovative output positively (Artz et al., 2010; Hitt, Hoskisson, Ireland, & Harrison, 1991; Hitt, Hoskisson, & Kim, 1997).

A drawback of this measure is that it cannot capture the rareness created by R&D intensity, which may be captured better by patents. However, there are ample research findings that report a positive relationship between a firm's R&D intensity and patents (Artz et al., 2010; Bogner & Bansal, 2007; Hagedoorn & Duysters, 2002; Katila & Ahuja, 2002).

3.4.4.3. Marketing assets

Similar to technological assets, marketing assets can be approached with the propensity of firm investment in marketing activities. It is defined as marketing-related investments designed to develop and access markets and gain market share, and operationalized as the ratio of a firm's marketing-related expenses compared to its total revenues.

$$Mark_{Intensity} = Marketing_{expenses}/Revenue_{total}$$

Many studies use advertising expenses as a proxy to marketing expenses, but advertising covers only one of the marketing activities carried out by firms. We used marketing-related intensity rather than advertising intensity for this reason. Marketing-related expenses were not reported separately in Standard and Poor's COMPUSTAT database. Most annual reports include market-related expenses. We collected sales and marketing expenses from the firms' annual reports. For firms that did not report marketing expenses separately (14 firms), we used a proxy of marketing expenses, which is 80% of Sales, General and Administrative expenses (SG&A expenses) minus R&D expenses, to better capture marketing expenditures (Mizik & Jacobson, 2007). SG&A has been used in the past by researchers as a proxy for marketing spending (Dutta et al., 1999; Vinod & Rao, 2000).

3.4.4.4. Centrality

We use Bonacich alpha centrality, which is defined as a weighted sum of paths connecting partners to each position, where longer paths are weighted less (Bonacich, 2007). It is sensitive to the situation where firms with many relationships are connected to many firms with few relationships, or firms with few relationships are connected to a few firms with many relationships (Bonacich, 2007). Since our network contains firms with different degrees of partnerships, this is an appropriate way measure of centrality.

This measure captures aspects of centrality in which the importance of a firm's partners are taken into account (Bonacich & Lloyd, 2001). Firms are more centralized if they are connected to other centralized firms. We measured a firm's centrality using the routines as written in social network analysis software, the UCINET 6, as follow:

$$c_i = \Sigma A_{ij}(\alpha + \beta_{cj})$$

where:

c_i is the centrality of firm *i* in an adjacency matrix A[6]
α and β are weighting parameters reflecting the degree to which a firm's centrality is a function of the centrality to which a firm is connected

The centrality of each firm is therefore determined by the centrality of the other firms to which it is connected. The value of α is used to normalize the measure, while the value of β is an attenuation factor, which gives the amount of dependence of each firm's centrality on the centralities of the firms to which it is adjacent. We use the natural logarithm for this Bonacich centrality to normalize its distribution.

3.4.4.5. Structural Autonomy

A firm's structural autonomy indicates the potential benefits to that firm from occupying a position that connects different "sub networks" (Gnywali & Madhavan, 2001). As illustrated in **Figure 3.3.,** structural autonomy indicates a firm's access to structural holes in the partners' networks. Structural holes occur when partners in a firm's network are relatively unconnected to other firms. They indicate the existence of a network resource arising from diversity of information and bridging positions between disconnected networks of firms. We followed

[6] An adjacency matrix is a square matrix with a number of rows and columns that is equal to the number of firms in the data set. The elements in each cell of the matrix contain information about the relationship between each pair of firms. It represents who is connected to or "adjacent to" whom in a network as mapped by the relationship data that we gathered (Hanneman, 2005).

Zaheer (2005) and Gnyawali and Madhavan (2001) in assessing the presence of structural holes in the overall network of ties among firms, using a network constraint measure. A high level of network constraint indicates that the firm's partners are densely connected to one another, with high redundancy in resource flows, with a lack of structural holes (Gnywali & Madhavan, 2001; Koka & Prescott, 2008). Low levels of network constraint indicate sparsely connected network and more access to structural holes.

We measure network constraints in a manner that is consistent with Burt (1995), whose approach has been used extensively in different network studies (Gnywali & Madhavan, 2001; Koka & Prescott, 2008; Zaheer & Bell, 2005). We used a structural holes routine in UCINET 6 to obtain network constraints. Network constraint measures when a firm has a network without structural holes or separated from others (Burt, 1995). It is based on the argument that firm *i*'s benefits are constrained to the extent to which its contact firm *q* has invested heavily in a relationship with its other contact firm *j.* A firm can benefit the most when there is a hole between its contact, i.e., between *q* and *j*. The formula as found in (Burt, 1995) is as follows:

$$c_{ij} = p_{ij} + \sum_q p_{iq} p_{qj} , \qquad q \neq i, j$$

where c_{ij} represents the constraint of firm *i* from a lack of holes around contact *j,* p_{qj} is the proportion of firm *q*'s investment (time and energy with firm *j* and p_{ij} is the proportion of firm *i's* investment (time and energy) spent on firm *j.* The multiplication of p_{iq} and p_{qj}, when it is high, represents the investments (time and energy) have been made in the relationships between firm *i* and firm *q* leading back to firm *j*, adding firm *i's* direct investment on firm *j.* Since structural autonomy occurs when a firm is part of a network with structural holes between its partners, we can obtain a measure of structural autonomy as one minus the network constraint (Burt, 1995).

$$structural\ autonomy = 1 - network\ constraint$$

3.4.4.5. Other variables

There are other variables that are considered important but that are not included in this model, such as human capital and operating capabilities. Although operating capabilities are important, in the software industry, the costs of manufacturing, documenting and packaging are relatively small (Shapiro & Varian, 1998), with most expenses flowing into R&D and marketing. Moreover, although human resources are important and although they are a source of tacit knowledge, and as such a source of competitive advantage, their efforts are reflected by the levels of technological and marketing assets.

3.5. Results

We checked for the normality assumption, heterocedasticity and multicollinearity (Field, 2009; Hair, Black, Babin, Anderson, & Tatham, 2006). Following this check, we conducted case diagnostics to determine whether the regression models were stable across the sample or biased by particular observations (Field, 2009).

We iteratively conducted case diagnostics and assumption checks. We found several outliers. Before we decided to exclude them, we checked the annual reports and Internet for each observation, to determine the causes of irregularities in the data. We excluded 14 outliers, because the firms were undergoing major problems or restructuring, were acquired by other firms, undergoing bankruptcy or there was a lack of clarity in the annual reports. We consider that these events lead to differences in the unit of analysis (observed firms) or errors, as they do not represent valid data[7].

All the models met the normality assumption and the homoskedasticity assumption, as diagnosed from the graphs. Although there are still several outliers, as indicated by their Mahalanobis distance, their cook's distance is below one, except for one case. Thus, there is no real need to delete these cases, since none of them are influential, as indicated by the Cook's distance (Field, 2009). We decided to keep these cases in the analysis, especially those that reflect the characteristics of firms in the software industry. For instance, in the software industry, we were able to observe that the network is concentrated on several players such as Microsoft, Oracle, and SAP and many players that occupy niche segments (Iyer et al., 2006; Rosenkopf & Schilling, 2007; Schilling, 2009). Since deviation from normality is likely to be subtler, we conducted Kolmogorov-Smirnov tests on the standardized residuals for each model as suggested by Field (2009). We found that the normality assumption of residuals is valid.

[7] We conducted a regression analysis with five (5) outliers included, since those five firms can be considered valid samples and part of the pre-packaged software industry. However, they underwent major restructuring programs or experienced unusual events in the year 2007. The results of this regression analysis are shown in **Appendix A Table A.1**. In this analysis, we found that Case 31 is an influential case, since it reduces the importance of technological assets and their interaction terms with marketing assets, structural autonomy. Case 31 had slippage in several anticipated contracts and cost over-runs in a number of subsidiaries, which resulted in an Extraordinary General Meeting of its shareholders, which in turn affected customer confidence, led to lost or delayed prospective projects, and damaged internal moral, affecting firm performance. This also led to an irregularity in the data, making Case 31 one of the outliers. For the following analysis, we exclude the 14 outliers for two reasons. Firstly, the occurrences of the five firms can be categorized as unusual phenomena in the year of analysis, and secondly, the statistical results are in the same direction (though of somewhat different magnitude) as the results without outliers.

3.5.1. Descriptive analysis

Descriptive and a correlation analyses are presented in Table **3.1**. We see that technological assets (R&D intensity) account for 16% of the firms' revenues, and marketing assets accounts for 32% of their revenues. This suggests that our samples are similar to the average technological and marketing assets in the software industry as also found in the study by Bokhari (2007). The average size of firms in the sample in terms of number of employee is 5.279 employees. The range of firm size is between 70 and 84.233 employees. As expected, the average size is high. The average of firm size indicates that our samples consist of relatively big companies which make sense since our samples are publicly traded firms in the pre-packaged software industry. The average ROA is 4%, which is higher than the industrial average, which has a negative average as found in Lavie and Miller (2008). Firms in the industry are centralized around several main players, so we expect that there are several firms with a very high level of centrality, with the average of its normalized value of 94. The structural autonomy of these firms showed an average similar to that of the network industry.

As expected, there are significant correlations between the dependent variable (ROA) and the independent variables. We also observed significant association between the independent variables and their interaction terms. A significant and positive correlation between firm size and ROA is observed. Interestingly, technological and marketing assets have significant and negative correlations with ROA, contrary to what we expected. The correlations between technological and marketing assets on the one hand, and firm performance on the other hand, are more complex than a linear relationship (Yang, Chiao, & Kuo, 2010), which is why we checked the existence of non-linear relationships between internal resources and firm performance. As we observed an indication of non-linear relationships, we introduced squared terms for these internal resources, to determine the non-linear relationships. We found a significant and negative correlation between the squared term of marketing assets and ROA. This shows that the level of marketing assets is positively associated to ROA, but becomes negative above a certain threshold. An inverted U-shaped relationship is revealed. As expected, there is a positive correlation between external resources and profitability, suggesting that being engaged in more and diverse partnerships has a positive impact on profitability.

Table 3.1. Descriptive statistics and correlation analysis

No	Variables	Mean	St.Dev	1	2	3	4	5	6	7	8	9	10	11	12
1	ROA	.042	.083	1											
2	Firm Size	.490	1.410	.387***	1										
3	Tech Assets	.159	.086	-.209*	.084	1									
4	Mark Assets	.319	.127	-.347**	-.330***	.038	1								
5	Tech Assets Squared	.007	.020	-.060	-.031	.591***	-.193*	1							
6	Mark Assets Squared	.016	.028	-.476***	-.179*	.052	.434***	-.007	1						
7	Centrality	93.718	352.281	.267**	.477***	-.023	-.123	-.074	-.018	1					
8	Structural Autonomy	.477	.334	.372***	.563***	.298	-.099	-.029	-.160†	.289**	1				
9	TechxMark	.0004	.0106	-.115	-.044	-.539	.092	-.724***	.192*	.048	-.054	1			
10	CentxAuto	33.562	163.163	.187*	.335***	-.072	-.086	-.053	.009	.961***	.084	.042	1		
11	TechxCent	-.695	10.851	-.010	-.349***	-.559	.129	-.364	-.048	-.628***	-.278**	.338***	-.584***	1	
12	TechxAuto	.008	.027	.204*	-.133	-.084	-.055	.286**	-.039	-.105	-.193*	-.191*	-.058	.270**	1
13	MarkxCent	-5.408	36.151	-.160	-.371***	.057	-.038	.109	-.122	-.907***	-.148†	-.061	-.895***	.633***	.136
14	MarkxAuto	-.004	.046	.185†	.022	-.049	-.254**	-.023	-.483***	-.111	.112	.222*	-.142	.169†	.098

N=82 $^{\dagger}p < .10$ $^{*}p < .05$ $^{**}p < .01$ $^{***}p < .001$

As shown in **Table 3.1**., the result of the correlation analysis indicates the potential existence of multicollinearity between firm size and centrality or structural autonomy, as shown by a high level of bivariate correlations. We observed a high correlation between the interaction terms, for example the interaction between centrality and structural autonomy is highly correlated with centrality, which may cause multicollinearity in the regression table. We checked for Variance Inflation Factor (VIF) and tolerance values to diagnose multicollienarity problems. The diagnostic of multicollinearity in the regression analysis shows no multicollinearity problems, except when the two-terms interaction is introduced (centrality and the interaction between centrality and structural autonomy or centrality and the interaction between centrality and marketing assets).The interaction term between technological and marketing assets has a weak negative correlation with ROA. The interaction between centrality and autonomy is significantly and positively correlated with ROA. There are positive and significant correlations between profitability and the interaction terms between marketing asset and structural autonomy, as well as technological asset and structural autonomy. No association can be established for centrality.

3.5.2. Regression analysis

The results of the regression analysis with profitability (ROA) as a dependent variable are summarized in Table **3.2**.[8] The baseline model, i.e., Model **1**, analyses the relationship between firm size, as a control variable, and profitability. As shown in Models **2, 3** and **4**, we further introduced variables measuring internal resources, and examine their impact on profitability. We continued by analysing the relationship between external resources and profitability, as shown in Models **5** and **6**. Model **7** explores the interaction between internal and external resources, and its influence on profitability. All the models are significant, which suggests that the model fits the data, as shown in F-statistics and the proportion of variance explained (R^2). The R-square of the models ranges from 0.150 for Model 1 to 0.537 for Model **7**. This is in the similar range as the one found by previous researchers, as reported by Armstrong and Shimizu (2007). They found that, in 27 studies involving single industry and longitudinal design, the R-square ranges from 0.02 to 0.47, with an average of 0.08. This variance explained is also similar to the results of Zaheer and Bell (2005) that reported adjusted R-square of 0.506 for their interaction model between innovativeness and structural autonomy.

[8] We also conducted a regression analysis with Revenue Growth as a dependent variable, as shown in **Appendix A Table A.2**. The results are similar to the models with ROA as a dependent variable, but the R^2 is low and the model is only significant for a complete model.

Table 3.2. Regression result with ROA as a dependent variable

No.	Variables	Model						
		1	2	3	4	5	6	7
1.	Firm Size	.387*** (.000)	.331** (.002)	.332*** (.001)	.317** (.002)	.068 (.564)	.062 (.607)	.066 (.580)
2.	Technological assets		-.228 * (.023)	-.276* (.021)	-.312** (.010)	-.455*** (.000)	-.445*** (.000)	-.374 * (.019)
3.	Marketing assets		-.229* (.030)	-.040 (.314)	-.080 (.476)	-.108 (.305)	-.107 (.316)	-.139 (.220)
4.	Technological assets_squared			.103 (.390)	-.060 (.694)	.011 (.939)	.012 (.932)	-.117 (.456)
5.	Marketing assets_squared			-.384*** (.000)	-.332 ** (.003)	-.281** (.007)	-.282** (.007)	-.252 * (.047)
6.	Technological x Marketing assets				-.243† (.090)	-.271* (.044)	-.272 * (.045)	-.292† (.070)
7.	Centrality					.113 (.241)	.218 (.663)	.058 (.917)
8.	Structural autonomy					.366** (.002)	.347 * (.017)	.372* (.011)
9.	Centrality x Structural Autonomy						-.100 (.832)	-.103 (.823)
10.	Technological assets x Centrality							-.012 (.955)
11.	Technological assets x Structural autonomy							.236* (.025)
12.	Marketing assets x Centrality							-.185 (.532)
13.	Marketing assets x Structural autonomy							-.061 (.651)
	R^2	.150	.256	.377	.401	.490	.490	.537
	Adj. R^2	.139	.227	.336	.353	.434	.426	.448
	R^2 change	.150	.106	.122	.024	.089	.000	.047
	Sig. R^2 change	.000	.006	.001	.090	.003	.832	.156
	F-ratio	14.128	8.927	9.206	8.362	8.753	7.683	6.062
	Sig.	.019	.000	.000	.000	.000	.000	.000
	N	82	82	82	82	82	82	82
	The t-values are between brackets † $p < .10$ * $p < .05$ ** $p < .01$ *** $p < .001$							

As shown in Model **5,** the addition of external resources increases the R-square significantly (R^2=0.490, ΔR^2=0.089 with a significance of 0.003). Firm size has a significant positive relationship to profitability (β=.331 and p<.002). The effects of firm size on profitability disappear when external resources and the interaction terms are introduced. The reduced significance of firm size coefficients in Models **5**, **6** and **7** means that adding external resources induces multicollinearity, which creates shared variance between a firm's size and external resources, in particular centrality. Thus, it reduces the unique variance of a firm's size, making the estimation of each individual effect problematic (Hair et al, 2006). Thus, we use

the bivariate correlations to describe the relationships rather than the regression coefficient. When we examine the bivariate correlation, as shown in Table **3.1.**, we see that profitability is associated with firm size more than external resources.

Model 2 of Table 3.2 represents our conceptualization of the direct impact of internal resources on profitability. Based on this model, we observe the existence of the direct impact of internal resources on profitability, as predicted in Hypotheses **1** and **2**. Internal resources, measured in terms of technological assets (β=-.228 and p<.023) and marketing assets (β=-.229 and p<.030), significantly explain the variance of profitability. Moreover, the influence of these variables is stable across all models, suggesting that internal resources are clear sources of variance in profitability. However, the effects are in contrast to our expectation in Hypotheses **1** and **2.**

Since there is an indication of non-linearity in the relationship between internal resources and profitability, we introduce the squared terms of internal resources. The non-linearity relationship between internal resources and performance may emerge because internal resources may have a threshold level before they contribute to firm performance (Artz et al., 2010). **Model 3** of Table **3.2** shows the existence of a non-linear effect of internal resources on profitability. As shown in **Model 3**, the estimate of the squared term of marketing assets is significant and negative, while the estimate of technological assets is not. This suggests that there is an inverted U-shaped relationship between marketing assets and profitability (β=-.384 and p<.000). It also indicates that the squared term of marketing assets is a better explanatory variable than marketing asset, as shown by reduced unique variance of marketing assets. This relationship is stable across all models. Because the introduction of squared-terms of internal resources improves the model fit (ΔR^2=.122, p<0.001), we included the squared terms of internal resources in the next models.

Model **4** of Table **3.2** introduces the relationship between the interaction of internal resources and profitability. As observed, the model (ΔR^2=.024, p<.090) indicates there is a direct relationship between interaction of firm's internal resources to profitability (β=-.243 and p<.090). The interaction between marketing and technological asset is significant and negative, and stable across the Models **4, 5, 6 and 7**, which is contrary to our expectation in **Hypotheses 3**.

Model **5** of Table **3.2** represents our conceptualization of direct relationships between external resources and profitability. Based on this model, we observe the existence of a direct relationship between external resources and profitability, as predicted in Hypotheses **4** (i.e., centralized firms are more profitable) and **5** (i.e., structurally autonomous firms are more profitable). External resources, as measured by centrality and structural autonomy, show different effects on

profitability. Structural autonomy has a positive and significant effect (β=.366 and p<.002) on profitability, while centrality has no significant effect on profitability (β=0.100 and p<.389). These results support Hypothesis **5,** but not Hypothesis **4**. Moreover, the influence of structural autonomy is stable across the models, suggesting that external resources are also clear sources of variance in profitability.

Having observed the direct relationships of each type of resources independently, we examine the relationships in a more complete model, as shown in Model **7** of Table **3.2**. As shown in Models **2**, **3**, **4**, **5**, **6** and **7** of Table **3.2**, we can conclude that there are direct relationships between internal resources and profitability, in the opposite directions from those proposed in Hypotheses **1** and **2**. We can also conclude that there is a direct relationship between the interaction of internal resources and profitability, in opposite direction from what we proposed in Hypothesis **3**. Moreover, the F-test for the change in R-square in Model **2** to **5** indicates that the inclusion of external resources significantly improves the fit of the model. We can also conclude that there is a direct relationship between structural autonomy and profitability, supporting hypothesis **5**. We cannot observe a direct relationship between centrality and profitability, which means no support for Hypothesis **4**, or a direct relationship between the interaction of external resources and profitability, which means no support for Hypotheses **6**.

Model **7** of Table **3.2** explores the interaction effects of internal and external resources, as predicted in Hypotheses **7, 8, 9**, and **10**. We introduced two-terms interactions. There is an improved model fit from Model **6** to Model **7,** but only with limited significance (ΔR^2=0.047 , p<.156). As observed in Model **7**, we can only find a significant interaction between technological assets and structural autonomy, supporting Hypothesis **8,** whereas the other three interaction effects are not significant, i.e., we find no support for Hypotheses **7**, **9** and **10**.

To summary, the explained variance of profitability increases with the introduction of external resources. Internal resources are one source of variance in profitability. We see that technological assets, marketing assets and the interaction between the two are significant differentiators of firm profitability. In addition, we see that the interaction between technological assets and structural autonomy has a significant effect on profitability.

3.6. Discussion

The main focus of this chapter is on investigating the relationship between a firm's resources and its performance. The RBV suggests that a firm's resources are a source of heterogeneity, which explains variance in firm performance. We used profitability to measure firm performance and reflect one important economic

goal of a firm. In this chapter, we discussed firm resources in business networks. We aim to answer whether internal and external resources simultaneously explain variance in firm performance. In the context of publicly-traded software firms in a business network, we argued that external resources are an important part of a firm's resources, which means they are a source of a competitive advantage. We investigated and identified how internal resources and external resources contribute to firm performance. The findings are summarized in Table **3.3.**

Table 3.3. Summary of hypotheses and related findings

Hypotheses	Profitability		
	No.	**Expected**	**Findings**
Firm size		Positive	*Positive and significant*
INTERNAL RESOURCES			
Technological assets	*H-1*	*Positive*	*Negative and significant*
Technological assets squared			*Negative and non significant*
Marketing assets	*H-2*	*Positive*	*Negative and significant*
Marketing assets squared			*Negative and significant*
Interaction of technological and marketing assets	*H-3*	*Positive*	*Negative and significant*
EXTERNAL RESOURCES			
Centrality	*H-4*	*Positive*	*Positive but non significant*
Structural autonomy	*H-5*	*Positive*	*Positive and significant*
Interaction of centrality and structural autonomy	*H-6*	*Positive*	*Negative and non significant*
INTERACTION			
Technological assets x Centrality	*H-7*	*Positive*	*Negative and non significant*
Technological assets x Structural autonomy	*H-8*	*Positive*	*Positive and significant*
Marketing assets x Centrality	*H-9*	*Positive*	*Negative and non significant*
Marketing assets x Structural autonomy	*H-10*	*Positive*	*Negative and non significant*

As summarized in Table **3.3**, we discovered intriguing findings in our investigation. Observing the direct relationships of each independent variable, we found relationships that were not as we expected. These findings add on the current discussion of mixed findings in the relationship between a firm's resources and its performance. Our investigation also confirms that variance in firm performance can be better explained when the model simultaneously considers both internal and internal resources than when we only look at them separately. Moreover, intriguing results were found in the interaction between internal and external resources, as reflected in the two-term interactions.

3.6.1. Control variable: Firm size

Firm size is positively related to profitability. This suggests that large firms are more likely to have the required structure and routines for efficiency gains in place (Shin et al., 2009), which suggests that they are better able to use efficiency benefits to improve their profitability than small firms. Large firms are also more likely to have more bargaining power, enabling them to acquire capital or materials more efficiently, as well as realizing economies of scale from their diverse product or service quantities (Lee & Habte-Giorgis, 2004).

3.6.2. Internal resources

As shown in Table **3.3**, internal resources have a negative impact on profitability, which is in line with the notion that internal resources in the short term influence a firm's financial performance (Diaz-Diaz et al., 2008). However, the relationships go against our hypotheses. Although we did hypothesize a positive relationship, the opposite findings in the relationships between internal resources and performance could be explained by two factors: (1) the complexity in the relationship between a firm's resources and its performance and (2) the contextual factor.

First, the relationship between a firm's resources and its performance is more complex than a linear relationship (Yang et al., 2010). To address this, we introduced quadratic terms for these internal resources. The squared term of marketing assets gives a negative effect with regard to profitability. It implies that there is an inverted U-shaped relationship between marketing assets and profitability, which in turn suggests that there is an optimal level of marketing assets to be able to positively influence profitability. Having marketing assets above the optimal level may indicates that a firm is overspending in terms of marketing assets, which reduces the efficiency of marketing asset, which in turn reduces profitability. A similar line of reasoning can be applied for technological assets, but, although there is an indication of U-shaped relationship between technological assets and profitability, as shown in bivariate correlation, the regression analysis provides an inconclusive result.

Second, as discussed in Chapter 2, the contextual factors may influence the relationship between a firm's resources and performance. Since 2002, the software industry has been a relatively mature industry, as indicated by its steady growth and limited number of well-established firms competing intensely for market share (Bokhari, 2007). A mature market has distinct characteristics, in that most of the potential market growth is exhausted and a new life cycle needs to be started. Product expansion is needed to create a new product life cycle, to create growth and increase revenues. As this type of growth entails uncertainties, as well

as product-related and organizational complexity, existing resources may constrain a firm's growth, since they are path-dependent and specific in nature, making them less flexible when it comes to pursuing new direction of product expansion, which requires different resource configurations (Mishina, Pollock, & Porac, 2004). As growth is constrained, revenues may shrink, reducing margins from investing in existing resource configurations.

Reaching maturity in different vertical markets and product segments, firms cope with the potential of constrained growth from product expansion. Firms have greater incentives to pursue innovation that exploits their existing resources (Mishina et al., 2004). Focusing on a service or delivery type of innovation provides more incentives relative to more costly forms of innovation, such as product and technology innovation. The focus shifts towards services that significantly change product delivery and pricing (Cusumano, 2008), as can be seen from a shift in the revenue models, from product to service revenues, as reported in the financial reports. As reported in the firms' financial reports, since 2002, there has been a tendency for about 50% of revenues to come from service type inflow (Cusumano, 2008). Although this shift allows firms to maintain certain level of revenues, profit margins are lower. Firstly, service-type products can be viewed as incremental innovation, relying on existing innovations and cost efficiency activities, since they do not create additional demand, and result in profit margins that are lower than those of product licences (Bokhari, 2007). Secondly, the shift in focus also leads to changes in a firm's business model. As suggested by Bokhari (2007), the major growth factor in the software industry is the continued expansion and integration of the Internet. The maturing of Internet technology drives software firms to new business models, such as Service-Oriented Architecture (SOA) and Software-as-a-Service (SaaS), which may actually reduce revenues, since they eliminate service and maintenance revenues (Bokhari, 2007). It would appear that this may affect the revenues of software firms while there are fixed marketing costs that are less flexible, resulting in lower profitability. Moreover, this condition may also affect profitability through lower profit margins.

3.6.3. Interaction of internal resources

Since resources are complex, it is interesting to investigate how they interact with each other and influence firm performance. From the results, the interaction between technological and marketing assets is negative rather than positive, as hypothesized. This result also contradicts previous findings, which suggested the existence of a positive/complementary relationship (Dutta et al., 1999; Lin et al., 2006). Our hypotheses are based on their arguments, stemming from the need for marketing assets to create value from technological assets. In a high-technology

industry and in an industry characterized by network effects, a substitutive effect between technological assets and marketing assets may take place. Lower levels technological assets are not expected to lead to competitive advantage, which means that higher levels of marketing assets are needed to positively influence firm performance. At high levels of technological assets, a high level of competitive advantage is expected, which is partly reflected in product visibility and a large installed base. In this sense, technological assets are unique and difficult to substitute, due to the network effects of software markets. The more customers use certain technological products and their complementary products, the higher the number of potential customers (Shapiro & Varian, 1998). Once firms have reached a critical mass of users of their products, their products become more attractive and less investment is needed to market the products. Therefore, the interaction between high levels of technological assets and high levels of marketing assets affect firm performance negatively, because there is an inefficient use of resources.

In addition, the software industry is at a mature stage and has experienced threats from fierce competition and technological advancement that affect the software firms' business models. Revenues increasingly come from services rather than product sales (Cusumano, 2008). It means a shift in the allocation of strategic resources. It is necessary for firms to rejuvenate existing product offerings or conduct major campaigns to sell more services (Cusumano, 2008). This kind of business model thus needs more marketing assets and relatively few technological assets to be profitable, so that firms leverage existing technological assets and engage in incremental innovation or adjustment on it to be profitable. This suggests that a trade-off between marketing and technological assets may occur.

3.6.4. External resources

The only significant relationship between external resources and profitability is to be found in structural autonomy. The positive sign is in line with our expectations. Firms with structural autonomy bridge firms that are unconnected to each other, which enable them to access resources from unique parts of the network (Zaheer & Bell, 2005). Structural autonomy also reflects a firm's position in the network that bridges disconnected positions, which usually are located in different domains or markets. This enhances firm performance, which likely stems from having quick and efficient access to new information or developments that spur innovation and increase new growth areas for the firm (Zaheer & Bell, 2005).

Structural autonomy also means being connected to diverse product segments that complement a firm’s product/service offerings. This may indicate the richness of the firm's product/service offerings. It increases the perceived quality of the products, enabling firms to charge for premium price, which, in turn, increases

profitability. In addition, the availability of various complementary products, technologies, knowledge or information positively affects firm performance, since it indicates reduction in development time and costs, compared to a situation where firms have to develop them by themselves. For instance, being connected to firms in different regions may indicate that it is less costly and time-consuming for a firm to build knowledge regarding certain markets than using direct sales or local branch organizations, which increases profitability.

The regression analysis shows an insignificant relationship between centrality and firm performance. However, the bivariate correlation between centrality and profitability is significant, which may suggest that, while centralized firms are more profitable, the benefits of being in this position may not always outweigh the cost of developing and maintaining it (Tsai, 2001). Every relationship needs to be managed and, unless a firm use put an efficient mechanism to do so, the costs and risks associated with having many relationships may outweigh the benefits (Ireland et al., 2002). Being centrally positioned can also mean that a firm is connected to other centrally positioned firms, which may reduce their bargaining power and affect their ability to capture the increased potential value from such partnerships.

3.6.5. Interaction of external resources

Because resources are complex, it is interesting to see how centrality and structural autonomy interact with each other and influence firm performance. Our hypothesis is based on the argument that both positions can coexist, since a firm can enter into partnerships with different partners in multiple domains. We observed that some companies, such as SAP, Microsoft and Oracle, have both a high level of centrality and a high structural autonomy. This is confirmed by the bivariate relationship (correlation) between this interaction term and a firm's profitability, which shows that there is a positive and significant association and suggest a complementary effect. This association confirms the coexistence of structural autonomy and centrality because firms can create partnerships with different partners in multiple domains that increase density as well as variety (Gupta et.al., 2006). Firms create partnerships that help them to overcome its resource limitations through resource-sharing, and balance the tension between centrality and structural autonomy, by developing partnerships that focus on different market domains (Gupta et al., 2006). Having overcome the resource limitation to have high levels of centrality and structural autonomy brings two separate benefits to a firm. A firm benefits from exploring new resources with partners in different market domains through its structural autonomy position, as well as exploiting the complementary assets from partners through its central position. Nevertheless, the regression analysis does not indicate that there is a

significant relationship between the interaction effect involving a firm's centrality and its structural autonomy, and its profitability.

3.6.6. Interactions between internal and external resources

The interaction between a firm's structural autonomy with either technological assets or marketing assets has a positive and significant bivariate relationship with profitability. The significance of the interaction effect between marketing assets and structural autonomy disappears in the regression analysis, while the interaction effect between technological assets and structural autonomy remains. The interaction effect between technological assets and structural autonomy positively influences profitability, which confirms our conviction that high levels of technological assets are needed to capitalize on the non-redundant resources that are obtained from bridging disconnected segments or technological domains, and vice versa. High levels of technological assets represent knowledge-intensive products, which will be enriched with non-redundant resources, which in turn lead to better or newer applications of existing product offerings. They improve the reuse of existing technological assets in different applications, which reduces development time, improve product quality, and leads to a larger scope of applications. These advantages are reflected in improved profitability. Structural autonomy provides firms with non-redundant information (Lane & Lubatkin, 1998; Zaheer & Bell, 2005). It is complementary to internal resources. The findings are intriguing, since they confirm that having both internal and external resources will enable firms to create value-enhancing technologies or markets. It underscores the importance of having non-redundant knowledge that can be accessed by a firm through its network and interacts positively with internal resources.

3.7. Concluding Remarks

This chapter focused on answering the first question on *what are the firm's resources in a business network* (Q1) and *what is the relationship between those resources in a business network and firm performance* (Q2).

3.7.1. Conclusions

To answer the first question, we conceptualized the resources and their relationships with firm performance. As discussed, we suggested that a firm's internal and external resources are an important source of competitive advantage in a firm's external environment. Based on a literature review, we concluded that a firm's internal resources comprise the technological and marketing assets, while external resources comprise the firm's centrality and structural autonomy within a business network. We extend the RBV, which tends to focus on internal resources, by including external resources, which are available through partnerships, because

firms increasingly access value-creating resources residing beyond their boundaries. Not including these external resources may result in a low explanatory power of a firm's internal resources.

To answer the second question, we examined the relationship between a firm's resources and its performance. As discussed above, internal resources affect firm performance. Technological assets have a significant and negative effect on performance, as do marketing assets. The squared-term of technological assets has an inconclusive effect on a firm's performance. As for squared terms of marketing assets, they have a significant and negative effect on performance, as does the interaction of technological and marketing assets.

As far as external resources are concerned, their inclusion increases the variance explained in the relationships between a firm's resources and its performance, which confirms similar findings reported by Zaheer and Bell (2005). Structural autonomy has a significant and positive effect on performance. Unexpectedly, centrality has no significant effect on firm performance. Interaction of external resources has no significant effect on firm performance. The interaction of technological assets and structural autonomy has a significant and positive effect on performance, but other internal-external resource interactions have no significant effect on firm performance.

The fact that the findings contradict our expectations provides us with some insight into the relationships between firm's resources and performance. These relationships are not as straightforward as expected. Because the competitive advantage of resources depends on a firm's external environment, an extended view from internal to external orientation may be needed. The RBV is internally oriented, as it emphasizes economizing rather than strategizing (Peteraf and Barney, 2003). Strategic responses to emerging threats and opportunities in the firm's external environment may affect the relationship between the firm's resources and its performance (Barney & Arikan, 2001; Sirmon et al., 2007). This is similar to the concerns expressed by Acquaah (2003) and Lin & Wu (2010), who support the need to explicitly include a firm's strategic actions. This is also confirmed by our observations regarding the outliers, which are intriguing. As we investigated further, the firms in question faced specific circumstances as a result of their strategic actions. For example, Clarity commerce solutions PLC and SCI Entertainment underwent major restructuring programs, which affected their performance in the year under analysis. The five outliers provide us with the insight that the relationship between a firm's resources and its performance can be strongly influenced by its strategic actions. The joint interaction of firm strategy and external/network resources has been seen as important in understanding firm performance (Koka & Prescott, 2008; Venkatraman et al., 2008). Thus, observing

the irregularities in the data and other research findings, strategic actions may explain part of the unexplained variance in the model.

3.7.2. Limitations and further research

The results of a statistical analysis are best understood within the context of its limitations. Generalizability of our OLS results is limited due to the focus on the network of firms in the pre-packaged software industry. Our sample consists of firms that are publicly listed at stock exchanges, which means we only included the larger firms in the network. Thus, our findings may be limited by the characteristics of our sample. As we observe in the analysis, the influence of firm size is significant, and including smaller, i.e., private firms may provide deeper knowledge. Private firms are located mainly in the network periphery and they create value for the network by providing new product/services. In this sense, focusing only on the publicly listed firms means running the risk of leaving out important phenomena in the software industry or in its network structure. Moreover, although we chose an industry with relatively short product life cycles, to control for time lag effects, the results suggest that there may in fact be time lag effects in the relationship between firm resources and firm performance. These limitations suggest that further research can be done by acquiring additional observations with larger numbers of private firms and with more time points.

Our use of OLS to examine the relationship between a firm's resources and performance may limit the exploration of the complexity of relationships among firm resources, and their joint influence on firm performance. From the explanation of the findings in this chapter, we can conclude that resources are complex and create complex relationships among themselves. Capturing these complex relationships requires us to investigate the fit between them, which can be represented in regression analysis by introducing interaction terms. While the use of regression analysis is superior with large data sets and longitudinal settings, investigating the interaction terms with more than three variables is difficult. Other methods, such as Structural Equation Modelling (SEM) and configuration analysis, may suit such purposes better than regression analysis, especially for a single-industry design. Another way to achieve the same goal is by using case study analysis, as is suggested by Hoskinsson et al. (1999). Using case studies involving different data types may enable us to examine the idiosyncrasies of firm resources. However, our main objective in this chapter has been to investigate the extent to which internal and external resources explain firm performance. While the explanatory power of statistical findings is limited to the pre-packaged software industry, we believe that our findings may indicate a more a generic problem for other industries as well.

Further research is needed to examine the mechanisms that underlie the relationship between a firm's resources and its performance. There are two directions for further research. Firstly, the interaction effects are theoretically and empirically intriguing. Due to difficulty of interpreting the interaction effects with more than three variables (Fiss, 2011), examining these interaction effects between a firm's internal and external resources, and their relationships to firm performance, can be better done using more sophisticated methods that allow for a simultaneous investigation of multiple variables and their effects to firm performance. In the next chapter, we address the interaction effects between a firm's resources through configurations of resources. This is used for the case selection in **Chapter 4**.

Secondly, we believe that firm performance is not only dependent on the resources that firms possess or have access to, as articulated by the RBV and network perspective, but on the firms' strategic response to their external environment as well. This would suggest that we also need to examine the role of those strategic actions in the relationship between a firm's resources and its performance. Strategic actions may be an important variable that has so far been overlooked, while it is important when it comes to realizing the full potential of a firm's resources. Further investigation to examine the fit between a firm's resources and its strategic actions, and how they relate to firm performance, will help explain variances in firm performance. This is further investigated in **Chapter 4** as well.

4. Firm's Strategic Action in a Business Network

Chapter 3 supports the concerns of mixed findings found in the relationship between a firm's resources and its performance (Armstrong & Shimizu, 2007; Nothnagel, 2008). The results in **Chapter 3** indicate the possibility that there are other factors influencing that relationship: firm's strategic actions. In response, we asked this question: (Q3) *What are the various kinds of strategic actions that a firms can adopt in a business network*? Answering this question requires an exploratory analysis that allows us to examine the relationship between a firm's resources and its performance. The analysis will allow us to understand how firms act strategically in response to emerging threats and opportunities in their external environment. The approach in this exploratory analysis is to examine the factors discussed in **Chapter 3** (a firm's attributes, resources and strategic actions). We compare firms that have similar resource configurations but that vary in terms of their performance. In this way, we can conduct a qualitative analysis of finer-grained data as a follow up of the quantitative analysis in **Chapter 3.** We start this chapter by presenting a framework designed to identify a firm's strategic actions, and continue with a description of the research method. Next, we present the selection of cases and provide an overview for each case, followed by cross-case analyses.

4.1. A framework of a firm's strategic action in a business network

Resources contribute to firm performance if they are valuable, rare, inimitable and non-substitutable (VRIN). The relationship between its resources and performance is influenced by risks and uncertainties in its external environment. The emergence of technological breakthroughs, competitors' strategic moves and economic crises are all sources of emerging threats and opportunities. The way firms respond to these threats and opportunities can affect their performance in a positive or negative way. For instance, a firm with a strong technology or product offering may experience a reduction in its competitive advantage, which affects its performance due to other firms' aggressive actions that lock out its technology/product offerings or failure to envision changes in its technology trajectories (Schilling, 1998). When one firm is able to take strategic actions that may render its competitive advantage obsolete, it may be able to maintain a good performance. A much quoted example is the emergence of Microsoft (Schilling, 1998). Microsoft recognized the opportunity in providing an operation system for IBM's and IBM compatible PCs, an opportunity that was not taken by Digital Research Inc., to which it was initially offered. This strategic action underlined the vision of Microsoft on the future of the software industry, which is now

considered to be a networked industry (Arthur, 1996; Iansiti & Levien, 2004). Working together with IBM and taking advantage of IBM's huge installed base was an important factor in the relationship between Microsoft's resources and its performance.

The relationship between a firm's resources and its performance is influenced by its strategic actions. The main role of a firm's strategic actions is to understand and manage the alignment of its resources and external forces to achieve a better competitive advantage (Gatignon & Xuereb, 1997; Manu & Sriram, 1996). Such an alignment represents the firm's internal resource fit (internal arrangement of resources) and its external fit (the alignment with the external environment). Thus, strategic actions play a role in responding to the opportunities and threats in the resources and/or external environment, by finding an internal and external fit, which may enable firms to outperform other firms and create a competitive advantage.

There are two roles a firm's strategic actions play in influencing the relationship between its resources and performance: (1) enhancing and (2) protecting the VRIN conditions. Enhancing the VRIN conditions of resources is done by realizing the full potential of those resources, which involves identifying and exploiting opportunities by adapting to the external environment (Hakansson & Snehota, 2006). However, in a business network, responding by adapting is not enough. The adaptation mechanism in responding to opportunities results from the assumption that a firm's external environment is beyond its influence. In reality, the external environment can be controlled to some extent by firms through partnerships. Controlling the external environment requires firms to act in an entrepreneurial way. Since this means being visionary, it requires firms to think and act differently from their current course of action (Mintzberg et al., 1998). Firms need to respond in new ways to changes in an environment that is not completely known or understood to maintain product and market leadership. Entrepreneurial actions are dominated by actively searching for and shaping new opportunities (Mintzberg et al., 1998). They allow firms to create and shape opportunities proactively rather than passively and to seize available opportunities. As shown in **Figure 4.1.**, enhancing the VRIN conditions is characterized by vision, product leadership and market leadership. It reflects a firm's strategic actions to create and shape opportunities in the external environment, enhancing the VRIN conditions of resources.

The second role is protecting the VRIN conditions. The action to outperform other firms depends on the ability to protect the VRIN conditions from influences in the firm's internal and external environment. For resources that are under their control, firms create preventive or defensive measures to respond to the threats

that may reduce their competitive advantage. As for factors and resources in a business network that are not under the firm's complete control, protecting the VRIN conditions means that they need to manage risks and uncertainties that may reduce the VRIN conditions of resources. Thus, protecting the VRIN conditions is characterized by pursuing efficiency, managing dependency, managing risk and dealing with constant rivalry, as shown in Figure **4.1.**

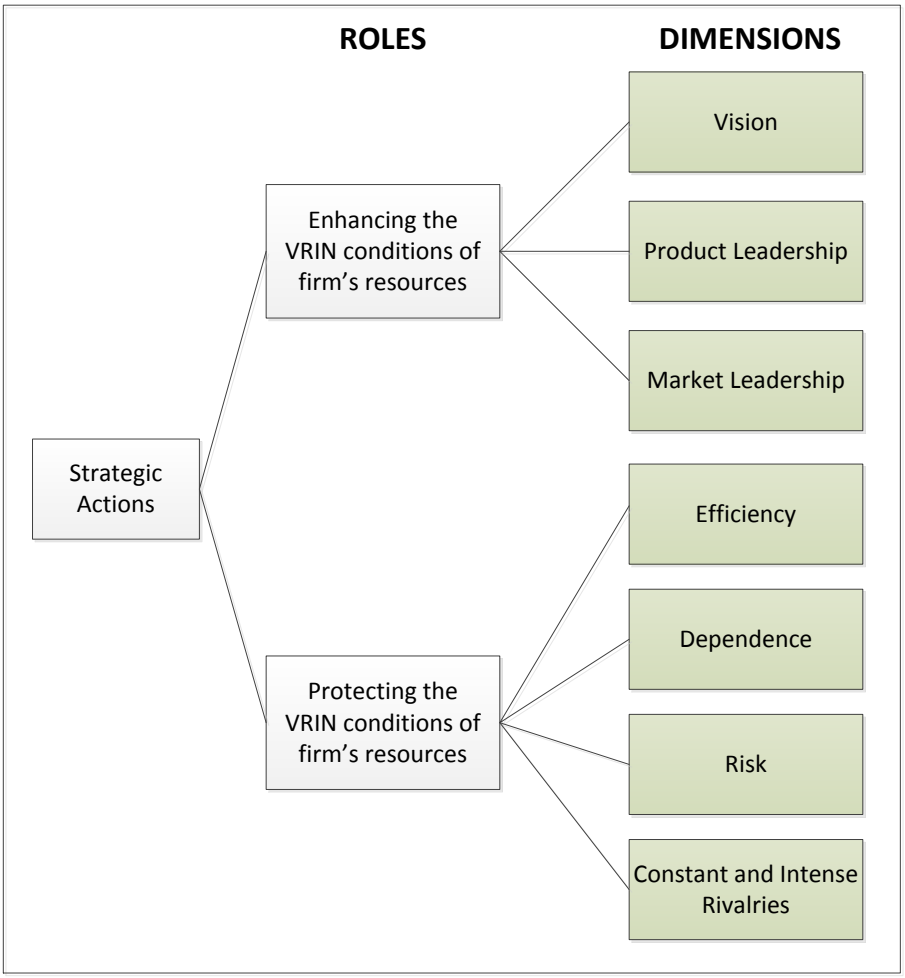

Figure 4.1. A framework of firm's strategic actions in a business network

To examine the strategic actions of firms, we conducted case studies, using the framework of strategic actions in a business network as discussed above. From existing literature, we specified the dimensions of a firm's strategic actions in a

business network that depict the two roles of strategic actions, enhancing and protecting the VRIN conditions.

4.1.1. Enhancing the VRIN conditions of a firm's resources

Enhancing the VRIN conditions means realizing the full potential of a firm's resources. To realize that full potential, firms engage in entrepreneurial activities to compete with competitors or potential entrants, by seizing and shaping new opportunities and meeting customer demand better. It involves creating product and market leadership proactively from existing resources. When firms can respond appropriately to changing opportunities in their external environment, the potential of their resources can be fully realized. A firm's strategic actions designed to enhance the VRIN conditions of its resources can be characterized by the dimensions shown in **Table 4.1.**: (1) product leadership, (2) market leadership and (3) vision.

Table 4.1. Identified dimensions that characterize a firm's strategic actions in enhancing the VRIN conditions of its resources

No.	Dimensions	References
1.	Product Leadership	(Ahuja, 2000; Dhanaraj & Parkhe, 2006; Iansiti & Levien, 2004; Miles & Snow, 1978; Treacy & Wiersema, 1993; Venkatraman et al., 2008)
2.	Market leadership	(Choi, 1994; Katz & Shapiro, 1986; Porter, 1980; Tanriverdi & Lee, 2008; Treacy & Wiersema, 1993; Venkatraman et al., 2008)
3.	Vision	(Ahuja, 2000; Gawer & Cusumano, 2002; Iansiti & Levien, 2004; Miles & Snow, 1978; Schilling, 1998; Treacy & Wiersema, 1993)

Enhancing the VRIN conditions is simultaneously characterized by having product and market leadership (Miles & Snow, 1978; Treacy & Wiersema, 1993). Product leadership can be achieved by structuring the firm's resources, developing new knowledge and creating resources that are necessary for the firm's survival or long-term interests. It is characterized by product superiority, competitive product margins and continuous product introductions, as well as by having partnerships with prominent firms in different product segments that provide complementary products that enhance the firm's product value. These complementary products lead to interoperability (Venkatraman et al., 2008) and richer resources (Ahuja, 2000), which increase a firm's ability to develop cutting-edges technologies (Iansiti & Levien, 2004), which in turn reduces the risk of reducing the firm's competitive advantage.

Market leadership is another important dimension, since product differentiation, uniqueness in service and features and product breadth help create flexibility and responsiveness, allow firms to reposition themselves in a changing environment (Miles & Snow, 1978; Porter, 1980; Treacy & Wiersema, 1993). In the example involving Microsoft, IBM and Digital Research, Microsoft was able to take advantage of network externalities that were provided by IBM's huge installed base, and complementary applications that enriched its product supply. At this point, a firm's product portfolio, which displays uniqueness in service and features, product breadth and company scope, plays an important role. Customers start to appreciate products that add compatibility and rich complementary applications to technological superiority (Choi, 1994; Katz & Shapiro, 1986; Tanriverdi & Lee, 2008). Customers require software that is simple to implement and change without having to make significant investments. In addition, brand visibility is important for market leadership, as it generates customer loyalty and capitalizes on network effects and customers' awareness and acceptance of a product. Market leadership is characterized by a diverse product portfolio, brand visibility, being involved in multiple technologies or operating in different industries and regions.

In response to the changing external environment, firms need to shape their paths proactively, which requires a vision on the future. Vision and flexibility make firms responsive to the threats and opportunities in their competitive environment and create firms' fit with the market (Miles & Snow, 1978; Treacy & Wiersema, 1993). Being responsive requires firms to discover and shape business opportunities across different technology trajectories or product markets (March, 1991). Firms can also shape the technology development trajectories if they are the leader in the development and, for instance, focus on research and development and market expansions, forging partnerships with other firms in different segments and domains (Ahuja, 2000; Iansiti & Levien, 2004; Venkatraman et al., 2008). They can also influence the development process proactively (Gawer & Cusumano, 2002; Schilling, 1998), i.e., actively displaying their power in standardization bodies or networks, by sponsoring technology and acquiring a controlling share of the market (Schilling, 1998).

4.1.2. Protecting the VRIN conditions of a firm's resources

Being embedded in a changing external environment means there are forces that may affect the firm's competitive advantage that is inherent in its resources. Several factors that reduce a firm's competitive advantage can be traced back to factors that influence the VRIN conditions of its resources. In their competitive environment, firms face constant and intense rivalries from competitors that make their resources less valuable, less rare or more easily imitated. A firm's

collaborative environment can also contain benefits and risks. It can provide complementary resources, but it can also generate dependence and the risk of imitation. As a result, the benefits from having access to complementary resources can be outweighed by the cost associated with such risks.

Although a firm's resources, as such, contain isolating mechanisms that protect their VRIN conditions in the short term, the firm's strategic actions are needed to safeguard its long-term protection as well. This means that firms need actively to respond to the possibility of having their competitive advantage reduced by (1) managing efficiency; (2) managing risk; (3) managing dependency and (4) responding to constant rivalry, as summarized in **Table 4.2**.

Table 4.2. Identified dimensions that characterize a firm's strategic actions in protecting the VRIN conditions of a firm's resources

No.	Dimensions	References
1.	Efficiency	(Christensen & Bower, 1998; Henderson & Clark, 1990; Miles & Snow, 1978; Treacy & Wiersema, 1993)
2.	Dependency	(Iansiti & Levien, 2004; Ireland et al., 2002; Katz & Shapiro, 1986)
3.	Risk	(Iansiti & Levien, 2004; Inkpen & Tsang, 2005; Ireland et al., 2002; Miles & Snow, 1978)
4.	Constant and intense rivalry	(Makadok, 2011)

Protecting the VRIN conditions by exploiting existing resources is related to improving efficiency and effectiveness in the utilization of a firm's resources. Cost-efficient actions, setting-up activity systems and having repeated and trust-based relationships can lead to stable or better VRIN conditions. Cost-efficient actions, such as organizational restructuring, changing compensation plan or employee cutbacks, are strategic actions that, although radical in nature, are sometimes needed in the face of particular environmental developments, such as global economic crisis or project overruns (Treacy & Wiersema, 1993). Setting up activity systems, such as the development or implementation of process management techniques and systems, increases efficiency by supporting resource allocation and the underlying decision-making process (Christensen & Bower, 1998). Activity systems (platforms) tighten communication, integration and coordination among a firm’s different functional areas or partners (Henderson & Clark, 1990; March, 1991). These activity systems, for example partner or community platforms, enable firms to develop their learning activities, allowing them to adapt to changes in the firm’s external environment more quickly (March, 1991). Improving

efficiency and effectiveness in the utilization of firm resources can be managed by improving trust. Trust also can be maintained by engaging in repeated and long-lasting relationships, since firms and their partners build mutual understanding, experience, resources, and tacit knowledge over time (Iansiti & Levien, 2004; Inkpen & Tsang, 2005).

Firms face threat of having their VRIN conditions reduced by being dependent on their partners, which might bring the threat of being locked-out of certain technology trajectories (Schilling, 2002). Being aligned to winning technological trajectories or multiple technological platforms may prevent a firm from being too dependent and increase opportunities to achieve its own strategic goals (Katz & Shapiro, 1986). Since partnerships always involve partners that may have different strategic interests, being connected to the right partners, with shared interests or goals, may lead to a positive outcome in terms of the dependency (Iansiti & Levien, 2004). A policy that clarifies partner selection criteria and a firm's expectation with regard to their partners helps the firm to take advantage of partnerships and simultaneously guard its own interests (Ireland et al., 2002). Another feature of managing dependency is reflected in the propensity to control, as shown in whether a firm prefers to use acquisitions or strategic partnerships to acquire complementary resources (Iansiti & Levien, 2004). Acquisitions are commonly preferred by firms that require complete control of complementary resources to reduce the risk of being dependent to others.

The propensity of a firm to manage the risks involved in being in a partnership affects the VRIN conditions, since partnerships create a certain degree of openness that may reduce the "valuable" and "rare" conditions of the firm's resources. This means that protecting the VRIN conditions requires measures that detail expectations and sanctions, for instance an intellectual property protection policy. Such measures enhance trust and reduce the risk of opportunistic behaviours by other firms (Ireland et al., 2002).

Responding to constant and intense rivalry from competitors, to deliver better products and satisfy customer preferences, requires firms to create customer loyalty, high switching cost or a broad product portfolio (Makadok, 2011). Occasionally, aggressive actions are needed, for example price predation or a predatory acquisition of rival firms (Makadok, 2011). We conclude that firms that show a range of actions that protect their VRIN conditions, i.e., managing efficiency, dependency, risks, and constant rivalry, are likely to sustain the relationship between their resources and performance.

4.2. Methods

For this study, we used a multi-case study approach to examine the influence of the firm's strategic actions on the relationship between its resources and performance within a business network. We used four case studies to contrast firms with different levels of performance but with similar resource configurations. A combination of quantitative and qualitative data was used to identify patterns that explain the differences in performance. To ensure validity and reliability, we followed the procedure outlined by Yin (2002). We ensured reliability by using a case study protocol, to subject each case to the same data collection guides and the same organized complete case data bases were conducted by two data collectors. The case validity was addressed by using multiple sources of evidence and multiple cases, in which all cases involve firms from the same industry, with similar size, age and resources. In addition, validity was ensured by carrying out within-case and cross-case analyses, as described in Yin (2002). In the within-case analyses, a logical explanation was developed on how the interrelationships among variables within a case contribute to the outcomes. This chain of evidence should be traceable in our data protocol and collected data, to ensure the internal validity and reliability of the case studies. In the cross-case analysis, we established causal analysis over several cases. We aimed at identifying patterns whereby certain variables may influence the outcomes.

4.2.1. Research design

We theorize that the relationship between resources and performance is influenced by the firm's strategic actions with regard to its resources, to ensure that it can capitalize on the benefits and minimize the losses associated with being involved in a business network. Therefore, we propose that *a firm showing a diverse range of strategic actions, i.e., fulfilling the two roles of a firm's strategic actions (enhancing and protecting the VRIN conditions of its resources) will perform better.*

We performed an exploratory analysis to investigate the unexpected findings from Chapter 3. To identify patterns, we started by defining dimensions of strategic actions as based on **Section 4.1**. In addition to observing strategic actions, we observed several firm-specific variables: (1) firm performance over time (2) attributes and (3) resources over time. Each case study involved the collection and analysis of quantitative data, followed by the collection of qualitative data on the firm in question (Creswell & Plano Clark, 2007). We used financial data, network data, annual reports, letters to the stockholders and press releases.

4.2.2. Case selection

We selected four contrasting cases from samples in the previous Chapter. This means that we conducted a within-industry study, which enables us to abstract from cross-industry effects, but at the same time it conditions the generalizability of the results. We selected the firms based on: (1) their configuration of firm-specific characteristics (i.e., the independent variables discussed in Chapter 3), (2) high and low levels of performance, and (3) a minimum availability of data sources needed to make a proper analysis. Examining the configuration of a firm's resources allows us to understand the fit among a set of firm-specific characteristics, which are firm size and resources (i.e., technological assets, marketing assets, centrality and structural autonomy), and their effects on firm performance. It enables us to understand how these variables interact with each other to create a configuration of firm-specific variables that can vary between high and low performing firms (Venkatraman, 1989).

To obtain configurations of firms we used a fuzzy set quantitative configuration analysis (FS-QCA) (Fiss, 2011). It will help us to gain insight into the causal relationship between a set of firm-specific variables, as independent variables, and firm performance as the dependent variable. FS-QCA is an analytical tool that uses Boolean algebra and fuzzy sets theory to do comparisons among relatively small or medium-sized cases, in order to understand the complex interplay of variables that explain the phenomenon under study (Schneider & Wagemann, 2006). FS-QCA assesses and compares complex causal statements using set relations between causes (independent variables) and outcomes (dependent variables). In this study, we assume that there is a complex relationship between a firm's resources and their effects on firm performance. FS-QCA helps us identify configurations of firm-specific characteristics that lead to high profitability. It also allows us to identify cases/firms that have similar configurations, but are different in terms of performance.

Firstly, we identified high and low performing firms that have a similar resource configuration. The steps that we took to identify the resource configurations are presented in **Appendix B.** We used the same five variables that we used in Chapter 3 (firm size, technological assets, marketing assets, centrality and structural autonomy). Firms belonging to the configurations from our FS-QCA analysis are presented in **Table 4.3**. As shown in **Table 4.3**, we identified firms with similar variable configurations categorized into high and low performing firms.

Secondly, for all firms, we checked for data availability ensuring, that the selected cases had the minimum required data sources. Next, we randomly selected two firms with high performance levels, and then selected two firms that had similar configurations but with contradictory performance. We selected SAP and

Autodesk as firms with a consistent configuration leading to high profitability, and OpenText and CA as firms with similar configurations, but with low profitability.

Table 4.3. Firms that have similar configuration of firm specific variables categorized into high and low performing firms using fs-QCA analysis

Categories	Companies
Cases with similar configuration and categorized into high performing firms	Microsoft Corp, Adobe Systems Inc, Bea Systems Inc, McAfee Inc, **Autodesk Corp**, Sybase Inc, Oracle Corp, Amdocs Ltd, **SAP AG**, BMC Software Inc, Citrix Systems Inc, Epicor Software Corp, Red Hat Inc
Cases with similar configuration and categorized into low performing firms	Synopsys Inc, Verisign Inc, Symantec Corp, **CA Inc**, **Open Text Corp**, Quest Software Inc, Sungard Data Systems Inc

As shown in **Figure 4.2.,** SAP AG and Autodesk, Inc. consistent show high levels of profitability. OpenText Corp started at the same level as SAP in 2002, but its profitability continued to decline over the years. CA had negative profitability in 2002, but that changed afterwards. Compared to the average profitability, all firms fall into the above average category. However, when we used weighted average performance relative to size, we found that CA and Open Text fall below the weighted average.

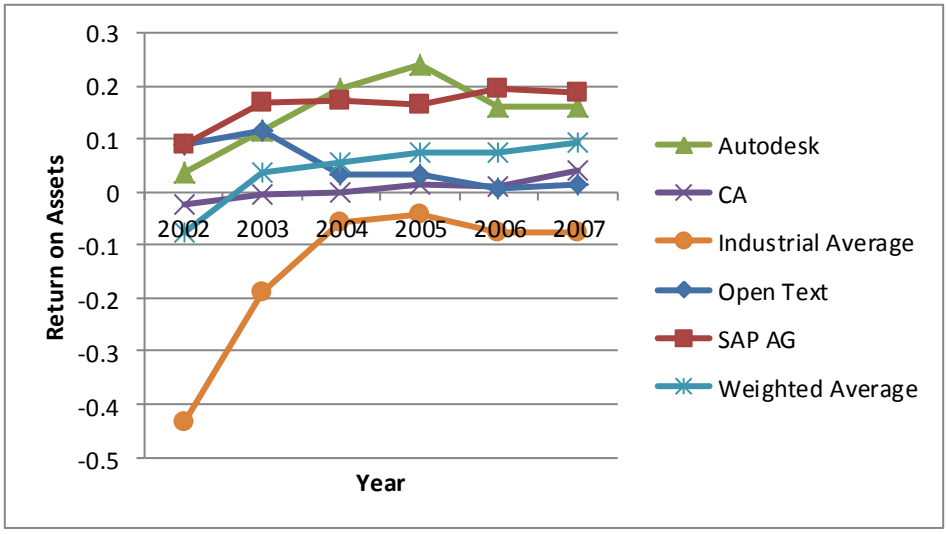

Figure 4.2. Firm performance as shown by its profitability (Return on Assets)

Not all cases were active in the same sub-segment of the software industry. SAP, Open Text and CA operate in the application software for enterprise solutions

software sub-segment, while Autodesk was the only firm positioned in a different sub-segment, i.e., application software for mass-market software products. SAP and Open Text, in particular, were placed in the same sub-segment, (application in process management application software), while CA could be placed in wider sub-segments, ranging from Business Process Management and Information Management to Infrastructure Management. Both sub-segments share similar characteristics, i.e., low entry barriers, highly globalized, highly concentrated segments, network effects, and the same success factors from a strategic point of view (Hoch et al., 2000).

There are differences between these two sub-segments. First, the products of firms operating in the enterprise software segment need to be customized, which is why firms in this segment depend on service firms for solutions installations (Hoch et al., 2000). Second, firms in the enterprise software segment sell fewer copies compared to mass-market products. The former difference means we need to be cautious about the findings related to partnerships, while the latter is not our immediate concern. While firms operating in mass markets benefit from selling more copies, firms in the enterprise software segments benefit from the substantial time and efforts that are needed to put their solutions in place (Hoch et al., 2000). This difference may lead to differences in firm performance. However, observing the remaining samples, there is no selection bias due to sub-segment differences, since we were able to identify firms with different levels of performance in both the enterprise solutions software sub-segment (i.e., Quest Software in low performing firms and Oracle in high performing firms) and the mass-market software sub-segment in high and low performing categories (i.e., Symantec Corp in low performing firms and McAfee in high performing firms).

4.2.3. Data collection

We used two types of data sources: (1) Internet documentation, including annual reports in Edgar Database, letters to stockholders, news releases, company websites and analyst's reports; and (2) archival records from COMPUSTAT global, for financial reports, and Thomson's SDC Platinum, for network data over a period of time, as used in **Chapter 3**. These two types of data source benefit our research by providing objective data and a broad coverage, in terms of time and events, and allowing us to review and access them repeatedly (Yin, 2002). Having said that, case study research also entails the risks of selectivity and reporting bias (Yin, 2002), which may reduce the validity of the case study. To deal with selectivity bias, we decided on the minimum number sources that should be available for each case and used them in data collection. As checked in the previous step, all sources are available for all cases.

We developed a data collection guide (see **Appendix C**), which is necessary to ensure the validity and reliability of the case studies. In this guide, we collected data on (1) firm-specific attributes, (2) firm resources, and (3) strategic actions. We used the variables we investigated and discussed in Chapter 3 (general attributes and firm resources), as follows:

- general attributes: size, age, revenue streams and products/services portfolios in 2007;
- trends in profitability and revenue growth over time (1998 – 2007);
- resources over time (2002 – 2007): technological and marketing assets, level of centrality position and structural autonomy in the network

We observed these variables from 2002 to 2007 and their trends over time, to capture historical aspects. Firm performance was observed using ROA and revenue growth over time. Internal resources were observed using technological assets (the ratio of a firm's R&D expenses to revenues) and marketing assets (the ratio of a firm's marketing expenses to revenues). External resources were captured using measures of network centrality and structural autonomy, derived from Thomson's SDC Platinum database.

The financial data we used to describe firm resources and firm performance over time came from Compustat Global between 2002 and 2007 (also see **Chapter 3**). We calculated the firms' position in a network using the same routines and data we used in **Chapter 3**. With regard to the firms' strategic actions, we use conceptualization discussed in Section 4.1 of this chapter. We further developed **Table 4.1** and **4.2**, to identify possible actions that characterized strategic actions in each dimension, as shown in **Table 4.4**, where we present the possible actions for each dimension, in the form of coding of words or similar phrases that we found in the reports or articles which we view as reflecting the dimension. Each coding is drawn from studies that discuss the dimension (see **Tables 4.1**. and **4.2**). Based on **Table 4.4.**, we developed the data collection guide**.**

In observing strategic actions, we focused on the year 2007 and let ourselves be guided by the questions and data sources presented in **Appendix C.** We observed the strategic actions of firms in enhancing and protecting the Valuable, Rare, Inimitable, and Non-substitutable (VRIN) conditions of their resource configurations. We captured the firms' strategic actions in the year 2007 by looking at their letters to stockholders, annual reports/10-K reports and press releases. We specifically identified data sources for each aspect that we wanted to measure. Following the identification of data sources, we identified firms' strategic actions by answering the questions included in the data collection guide**.**

Table 4.4. Possible strategic actions of firms in each respective dimension

No	Dimensions	Possible Actions	
		Internal Resources	**External Resources**
Enhancing VRIN conditions			
1.	Product leadership	Superiority of product quality (Treacy & Wiersema, 1993)	Partnerships with prominent firms (Ahuja 2000; Dhanaraj & Parkhe, 2006; Iansiti &Levien, 2004)
		Product margin (Treacy & Wiersema, 1993)	
		New product introductions (Treacy & Wiersema, 1993)	
2.	Market leadership	Product uniqueness in service and features (Porter, 1980)	Variety of complementary or product applications (Choi, 1994; Katz & Shapiro, 1986; Tanriverdi & Lee, 2008; Venkatraman et al., 2008)
		Product breadth (Venkatraman et al., 2008)	
		Company scope (Venkatraman et al., 2008)	
		Brands visibility (Treacy & Wiersema, 1993)	
3.	Vision	Setting vision and taking initiatives (Miles & Snow, 1978; March, 1991)	Involvement in standardization bodies or networks (Gawer & Cusumano, 2002; Schilling, 1998)
		Focus on research and development or market expansions (Miles & Snow, 1978; Treacy & Wiersema, 1993)	Partnerships with firms in different product segments/domains (Ahuja 2000; Iansiti & Levien, 2004; Venkatraman et al., 2008)
Protecting VRIN conditions			
1.	Efficiency	Reorganization, employee reduction (Treacy & Wiersema, 1993)	Availability of platform (a system) to connect partners and learn from them (Christensen & Bower, 1998; Henderson & Clarck, 1990)
		Integration or coordination among different functional areas (March 1991; Miles & Snow, 1978; Treacy & Wiersema, 1993)	Propensity in developing redundant or long-lasting relationship (Iansiti & Levien, 2004; Inkpen and Tsang, 2005)
2.	Dependency	Compatibility to multiple product platform (Katz & Shapiro, 1986)	Emphasis on complete integration versus collaboration (Iansiti & Levien, 2004)
			Availability of policy on partnerships (Ireland et al., 2002)
3.	Risk	Proprietary asset protection policy (Ireland et al., 2002)	Operate on multiple product segments (Miles & Snow, 1978)
			Open vs close technology architecture (Iansiti & Levien, 2004)
4.	Constant and intense rivalry	Pricing instruments (Makadok, 2011)	Predatory acquisition (Makadok, 2011)

In answering those questions in **Appendix C** we looked for statements reflecting possible strategic actions and used keywords from each possible strategic action, as shown in **Table 4.4**. We made a case study database, which enabled us to systematically write the case reports. We verified this categorization and did cross checks on both the data sources and the answers, systematically collecting data and enhancing the reliability of the cases (Yin, 2002).

4.2.4. Data analysis

After compiling a database of the strategic actions for each firm, we prepared a report outline to present each case. A report guideline was prepared and used to write each case, to ensure a similar report structure. By writing the reports, we carried out within-case analysis, providing a description of each case, which is central to generating insights (Eisenhardt, 1989; Gersick, 1988; Pettigrew, 1990). We made descriptions with the use of graphs of financial and network-related variables for each case firm over time (Leonard-Barton & Deschamps, 1988; Mintzberg & McHugh, 1985), which allowed us to become familiar with each case and to see unique patterns in each case, before generalizing the patterns across the cases (Eisenhardt, 1989). We tried to have an informant from the company to check the results, which two companies declined, due to the nature of the research, which is categorized as an "unsolicited study" (a study that is done without the authorization from the firm), while the other two responded without providing any further remarks.

After writing the individual case study reports, we carried out a cross-case comparison to look for similarities and differences (Eisenhardt, 1989). The cross-case comparison was done across the dimensions we developed in **Section 4.1** and **Appendix C**. We compared the contrasting cases across the dimensions defined in **Tables 4.1**. and **4.2**., which forced us to look for similarities and differences between cases that may lead us to a more sophisticated understanding of the role of strategic actions in the relationship between a firm's resources and performance (Eisenhardt, 1989).

4.3. Within-case analyses

Based on the variables and data collected, we conducted a within-case analysis by writing a report describing firm performance over time, followed by the firm's attributes, resources and strategic actions. In this section, a summary of the within-case analysis of each firm is presented, including a description of the firm's attributes, resources and strategic actions. Next, we developed logical explanations of how these variables contribute to the performance of each firm.

4.3.1. SAP AG

The findings of case analysis are shown in **Table 4.5.** Because the first firm, SAP AG, was an early player in the enterprise application software segment, it was able to benefit from first mover advantages. SAP operates in the enterprise solutions software segment. SAP had a focus product portfolio with variations in the delivery and industry-specific needs positioning its product with flexibility, business insight, industry-specific content and enterprise-specific solutions. Its business model consisted of an almost equal distribution of its revenue streams: the sale of licenses (35%), support (37%) and service (28%).

Table 4.5. Summaries of SAP's case description

No.	Dimensions	Summaries
	Attributes	
1.	founded (age)	1972 (35 years)
2.	product portfolio	focus on enterprise application software
3.	product positioning	flexibility, business insight, industry-specific content and enterprise specific solutions
4.	business model	license (35%) support (37%) service (28%)
5.	company scope	focus on enterprise solutions with variation in the delivery and industry-specific needs
6.	revenues (in 2007)	€ 10,171,000,000 (US $13,364,000,000)
7	employees (in 2007)	43,861
	Performance	
1.	profit over time	increasing trend
2.	growth over time	increasing trend with a slight decrease in 2007
	Resources	
1.	technological assets	
	- over time	stable
	- relationship to firm performance	no obvious association to performance in the previous year
2.	marketing assets	
	- over time	stable
	- relationship to firm performance	no obvious association to performance in the previous year
3.	centrality	
	- over time	stable, with a dip in 2005
	- relationship to firm performance	no obvious association to performance in the previous year

Table 4.5. Summaries of SAP's case description (*continued)*

No.	Dimensions	Summaries
4.	structural autonomy	
	- over time	stable and high, with a dip in 2007
	- relationship to firm performance	no obvious association to performance in the previous year
Strategic Actions		
1.	Enhancing the VRIN conditions	
	- technological leadership	internal resources - continuously innovate on the offerings in the pipeline - global SAP research centers in 5 countries - fostering employee innovative (entrepreneurial) trait - introducing 5 new products and 11 new features in 2007
		external resources - COIL was established - introducing SAP NetWeaver fund - continued technological partnerships with partners
	- market leadership	internal resources - extra investment for market campaign on current product offering - restructuring and better use of its marketing infrastructures in different regions
		external resources - partnerships with various firms to gain access to new markets in different regions and domains - 4 marketing partnerships were established in 2007
	- vision	internal resources - provide "Industry Specific Solution Map"
		external resources - initiate distinct and regular partnerships activities, conference and gathering, i.e. SAPPHIRE, SAP International Utilities Conference, SAP TechEd

Table 4.5. Summaries of SAP's case description (*continued)*

No.	Dimensions	Summaries
2.	Protecting the VRIN conditions	
	- efficiency traits	internal resources - restructuring following acquisitions - moving the support organization to low-cost locations (Bulgaria, China and India)
		external resources - provide various platform to facilitate exchanges among different type of partners - redundant and long-lasting relationships with some companies
	- managing dependency	- use of acquisitions to acquire new technological competences or new markets - 5 acquisitions in the past 5 years. and the biggest one was BusinessObject - detail policies on different type of partners were and still are available - choice of SAP's strategic partners was based on multiple and evolving criteria - SAP Solution Map was also one tool that is used to govern SAP relationship with partners which opportunities are available and which will be pursued by SAP
	- constant rivalry	- in response to its rival's movements, SAP can be aggressive by providing discount or acquiring a firm
	- managing risk	internal resources - while SAP still relied on legal protection, (i.e. a combination of IP protection such as trade secret, copyright patent, etc.), SAP understood the need for openness - providing SAP's copyright agents to deal with complaints and claims of other users
		external resources - active participation in the standards community - SAP was less dependent on one technology trajectory by working with multiple partners and participating in industry-wide initiatives with other vendors to determine standards, which ensured continued functionality and compatibility of its products

A stable increasing performance trend, in terms of profitability and revenue growth, had been observed in the period of 1998-2007, as shown in **Figure 4.3**. The company's internal resources were relatively stable and below industry average over the period of 2002-2007. Its external resources are relatively stable and high over the period of 2002-2007.

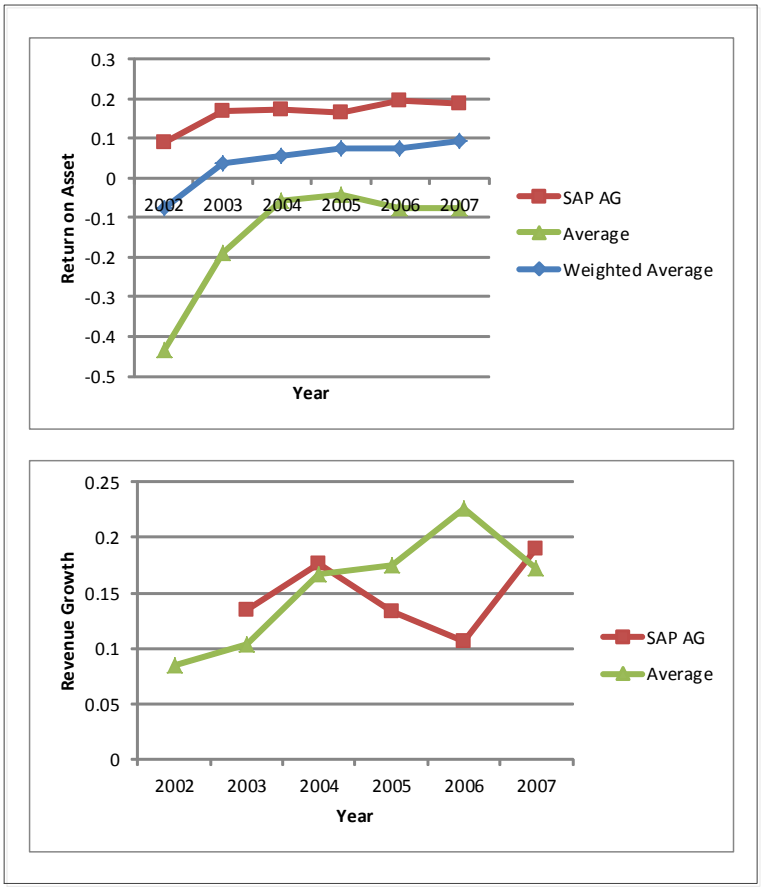

Figure 4.3. SAP's profitability (return on assets) and revenue growth over time

As shown in **Figure 4.4.**, SAP's technological assets were relatively stable and below the industrial average over the period of 2002-2007. It was just approximately on a par with the industrial average in 2007. Similar to its technological assets, SAP's marketing assets were relatively stable over the period in question, as shown in **Figure 4.4.** This indicates that SAP's spending in marketing was in line with the increase in revenues. SAP allocated approximately 15% of its revenues to development of its marketing assets in 2002. In the years after that, SAP reduced its marketing spending and it remained stable at around

11%. SAP's marketing spending was approximately 11% of its revenue to build its marketing assets, but it was still below the industrial average.

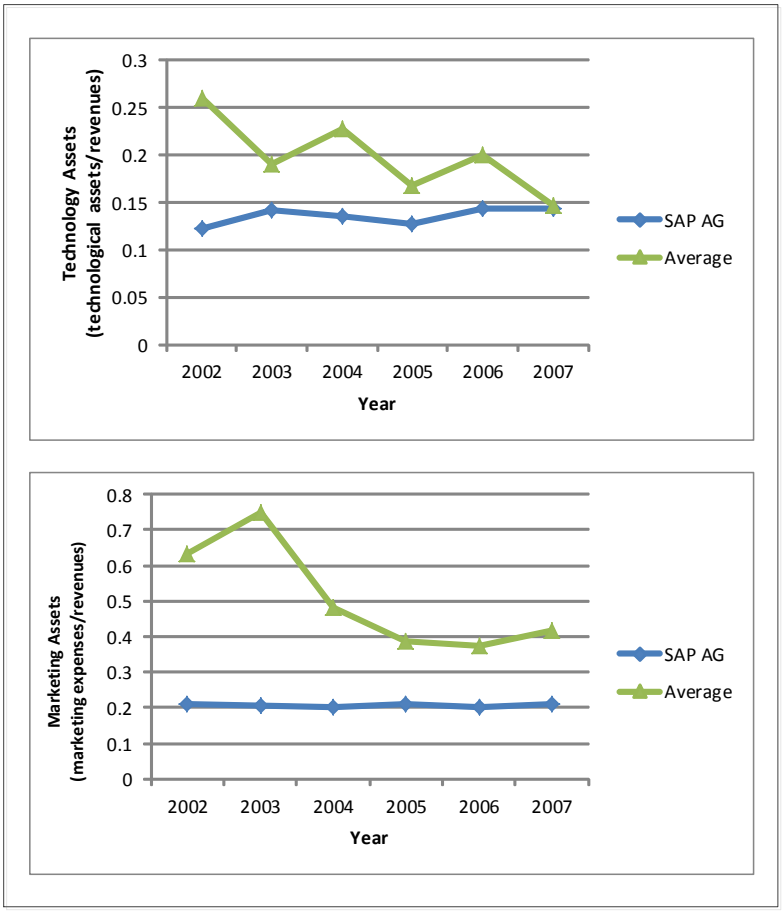

Figure 4.4. SAP's technological and marketing assets over time

SAP's product leaderships can be seen from its R&D activities, which were directed to expand its product portfolio with innovative offerings, releases to small and medium-sized firms, and functions to SAP NetWeaver technology platform, and enterprise application and industry solution offerings. SAP's product portfolio in platform technology includes, for instance, Service-Oriented Architecture (SOA), through its SAP NetWeaver platform technology. SAP NetWeaver introduced an innovative approach to the open platform that allows applications to be developed and accessed as a web service, from which consumers can pick the applications that meet their needs. Those offerings drove the organic growth of SAP and provided a basis for wider and deeper SAP's product offerings in the following years. These product portfolios of technological assets were one

important source of SAP's competitive advantage. The technological assets were developed using internal as well as external resources.

As the result of this continuous and stable investment, SAP has accumulated marketing assets in the form of brand, sales forces, marketing channels and IT infrastructures. SAP had more than 46,100 customers in over 120 countries, employed more than 43,800 people at sales and development locations in more than 50 countries in the Europe, the Middle East, Asia, the Americas and the Asia Pacific Japan regions in 2007 (SAP's Annual Report, 2007). These infrastructures, brands, and sales and channel capabilities were the important assets that SAP had to enter new markets, and bring its innovations to the market. These marketing assets were developed using both internal and external resources. SAP used partnerships (e.g., IDS Scheer and Vistex reseller agreements in 2007) and acquisitions to extend its marketing assets (for instance SAP's acquisition of its exclusive partner, SAP Arabia).

SAP emphasized the importance of partnerships with other firms, customers, academics, analysts and developers. This was reflected in the huge number of connections within its network, the SAP ecosystem. As shown in **Figure 4.5.**, SAP occupied a central position in the network of software firms, together with firms such as Microsoft and Oracle. Over the years, it has always been centrally positioned. Even during in the dip, in 2005, SAP was still placed above average. This central position was the accumulated result of SAP's different partnering initiatives.

Structural autonomy signals the diversity of a firm's partners, since its partners and their partners are not connected to each other, unless through the focal firm. It is the result of an accumulation of the firm's partnering initiatives in expanding its product offering with industry-specific context and features, or in offering its products in new markets. SAP has diverse partners, including partners and customers from different segments and industries. As can be seen in **Figure 4.5**, we can observe a stable position, with a slight decline in 2007, which may have been caused by the consolidation in the network of software firms.

SAP's focused on organic growth, co-innovation, acquisitions, expanding its core business through expanding solutions, developing new business in small midmarket, and increase its presence in key markets, regions, and industries (Letter to Stockholders, 2007). SAP continued to mostly pursue organic growth in 2007, increasing its software and software-related service revenues, which was slightly hampered by the additional investments announced in early 2007 for SAP Business ByDesign (Annual Report, 2007). The added value of its product leadership in more than 25 distinct industries, combined with the support of the world's largest partner ecosystem, has helped SAP to become the world's

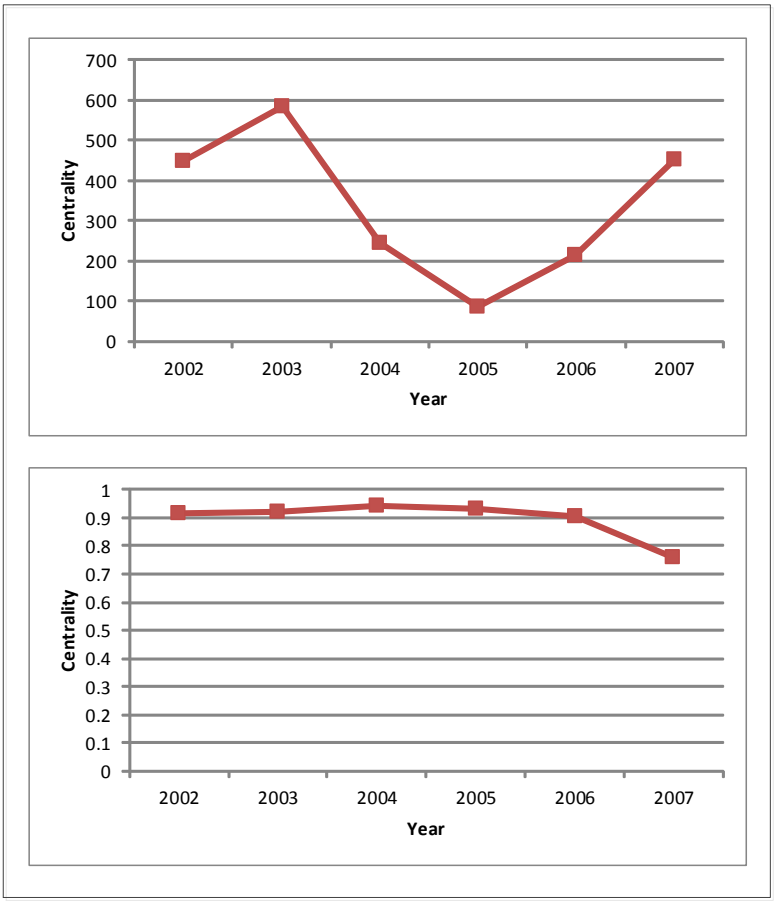

Figure 4.5. SAP's centrality and structural autonomy over time

enterprise software leader. Co-innovation within a network of partners has enhanced SAP's research and development organization, with many other centres of innovation, ranging from select universities (including the University Alliance program), industry forums and online communities, to the Co-Innovation Lab (COIL) opened in Palo Alto, California, in mid-2007. In 2004, SAP created a road map to establish enterprise Service-Oriented Architecture, based on its vision that enterprise software increasingly focuses on providing new ways to add value and differentiate companies from the global competition, rather than only on mere efficiency and cost reduction. It means SAP's products are positioned as a combination of usability, functionality and flexibility, made possible by the array of complementary solutions from the SAP ecosystem of hardware and software partners, who build on its solid platform.

In addition to its proactive actions in developing product and market leadership, SAP also engaged in several efficiency-related actions in terms of improving of company routines, reorganization and cost reductions. For example, SAP moved support organizations into low-cost locations such as Bulgaria, China and India. To ensure an efficient and effective transfer of knowledge within its company and ecosystem, SAP provided some collaboration tools, such as partner management systems. Several tools are provided by SAP with different policies for memberships for different types of partners, which cover the guidelines of partnerships, SAP commitments and targets. In this way, SAP makes its expectations clear for potential partners regarding the goal of partnerships and the way the partnerships are organized.

Acknowledging the importance of partner management, SAP adopted a win-win approach with its partners. SAP makes sure that partners can also gain something from the partnership, while also recognizing the risk of opportunistic behaviour. SAP responded to this threat by providing detailed policies for different types of partnerships, based on evolving criteria. In a way, SAP also focuses on efficiency by using different sets of policies/criteria/tools to extract the potential benefits and also create trust between itself and its partners. In addition, SAP chose its strategic partners carefully on the basis of multiple and evolving criteria (Iansiti & Lakhani, 2009).

SAP used acquisitions, which were intended to broaden the solutions it offers, new technological competences or new markets. SAP uses acquisitions rather than strategic partnerships in certain cases, to compete with other firms in market segments with excellent potential for growth and the ability to complement SAP's portfolio, but these firms have already established their presence. SAP can also act aggressively in response to its competitors' actions. The acquisition of TommorowNow was a response to the acquisition of PeopleSoft by Oracle, which led SAP to legal litigation for IP infringement.

To summarize, as an early player in enterprise software market, SAP showed a relatively stable growing trend in terms of its performance between 1998 and 2007. Its internal resources were below the industry's average, while its external resources were above that average. This may indicate that external resources were used to complement internal resources, which may result in positive influence to profitability. In addition, the trends of both external and internal resource were stable in 2002-2007, which indicates a continuous build-up of its resources, which in turn may be the results of the firm's strategic actions, which were well aligned with its resources and external environment. As shown above, SAP engaged in a range of activities, focusing on efficiency and differentiation, capitalizing and leveraging both its internal and external resources. A focus on

efficiency and differentiation, based on the existing product offering, provides a wider customer base and improves economies of scope and, as such, enhances profitability. SAP also leveraged its internal and external resources and those of its partners, through its ecosystem platform, which triggered co-innovation and allowed SAP to share its vision with its partners.

4.3.2. Autodesk, Inc

The findings of the case analysis are shown in **Table 4.6.** Founded in 1982, Autodesk has become one of the world's leading design software and service companies. Autodesk's product and service offerings were focused on Autodesk's main domain, i.e., providing pre-packaged software to its customers. Autodesk operated in mass-market software products. It has a focused product portfolio, with variations in industry-specific needs, which involve two large divisions: the Design Solutions Group (DSG) and the Media and Entertainment Division. The DSG division serves architects, engineers, drafters, design-related professionals, civil engineers, designers, surveyors and geospatial professionals, while the media entertainment division is focused on serving film and video artists, game developers, design visualization professionals and virtual effect artists.

Table 4.6. Summaries of Autodesk's case analysis

No.	Dimensions	Summaries
	Attributes	
1.	founded (age)	1982 (25 years)
2.	product portfolio	design software and services companies with two divisions (1) Design Solutions Group and (2) Media and Entertainment Division
3.	product positioning	providing products with solution that help customers to innovate, reduce design time and costs, and improve their productivity and profitability
4.	business model	license (82%) maintenance (18%)
5.	company scope	packaged mass market software
6.	Revenues	US$ 2,171,900,000
7.	employees	7,300
	Performance	
1.	profit over time	increasing trend until 2005 and stable afterwards
2.	growth over time	above average with a peak in 2004
	Resources	
1.	technological assets	
	- over time	relatively stable and above average
	- relationship to firm performance	no obvious association to performance in the previous year

Table 4.6. Summaries of Autodesk's case analysis (*continued*)

No.	Dimensions	Summaries
2.	marketing assets	
	- over time	relatively stable and below average
	- relationship to firm performance	positive association between firm performance in the previous year and marketing assets
3.	centrality	
	- over time	relatively stable in the beginning, with sudden peak in 2007
	- relationship to firm performance	no obvious association to performance in the previous year
4.	structural autonomy	
	- over time	stable and high, with a dip in 2005
	- relationship to firm performance	negative association to performance in the previous year
Strategic Actions		
1.	Enhancing the VRIN conditions	
	- technological leadership	internal resources - introducing new products and technical features - introducing 4 new features
		external resources - continued technological partnerships with partners in different segments and industry domain - initiated Autodesk Research, The Autodesk Research Donation Program, and Research Internship Program
	- market leadership	internal resources - employing mass marketing techniques such as web casts, seminars, telemarketing, advertisement - providing tools for supporting customer in using the product - building outlet to expose Autodesk's products - reorganizing the company into market groups for families of products in specific industries and vertical markets
		external resources - Autodesk worked with a network of 1,700 resellers and distributors worldwide - partnerships with 2,900 developers to create interoperable products that enhance the scope of Autodesk's offerings

Table 4.6. Summaries of Autodesk's case analysis (*continued*)

No.	Dimensions	Summaries
	- vision	- actively invite participation of valued customers and partners in the Autodesk Customer Briefing Program in which Autodesk share its 3-5 years plan - initiate events (i.e. technical briefings, customer summits, industry summit) to tap into and be exposed to the dynamics of external environment - provide Autodesk communities and fund programs that facilitate knowledge exchange (i.e. Autodesk Research)
2.	Protecting the VRIN conditions	
	- efficiency and analytical traits	internal resources - termination of 316 employees worldwide - closed some facilities
		external resources - providing a platform that connect partners - launching global community for university engineers, architects and designers to have access to numerous test users.
	- managing dependency	- Autodesk prefers acquisition rather than technological partnerships - in 2007, Autodesk acquired 2 companies - since 2004, 12 acquisitions have been made
	- constant rivalry	- appropriately priced Autodesk products - offering education program and specially priced software purchasing options
	- managing risk	internal resources - Autodesk relied on legal protection, i.e. a combination of IP protection, such as trade secrets, copyrights, patents, etc.
		external resources - Autodesk maintains an open-architecture design on its products, which results in a rich (wide variety) of developers that provide complementary products and industry-specific solutions - Autodesk made a transition from an SGI platform towards a more standard and open PC-based Linux platform

Autodesk experienced an increasing trend, both in profit and growth. A stable increasing trend in Autodesk's performance, in terms of profitability and revenues,

was observed for the period 2002-2007, with a peak in growth in 2004 as shown **in Figure 4.6**. After 2004, the growth decreased but was still above the industry average.

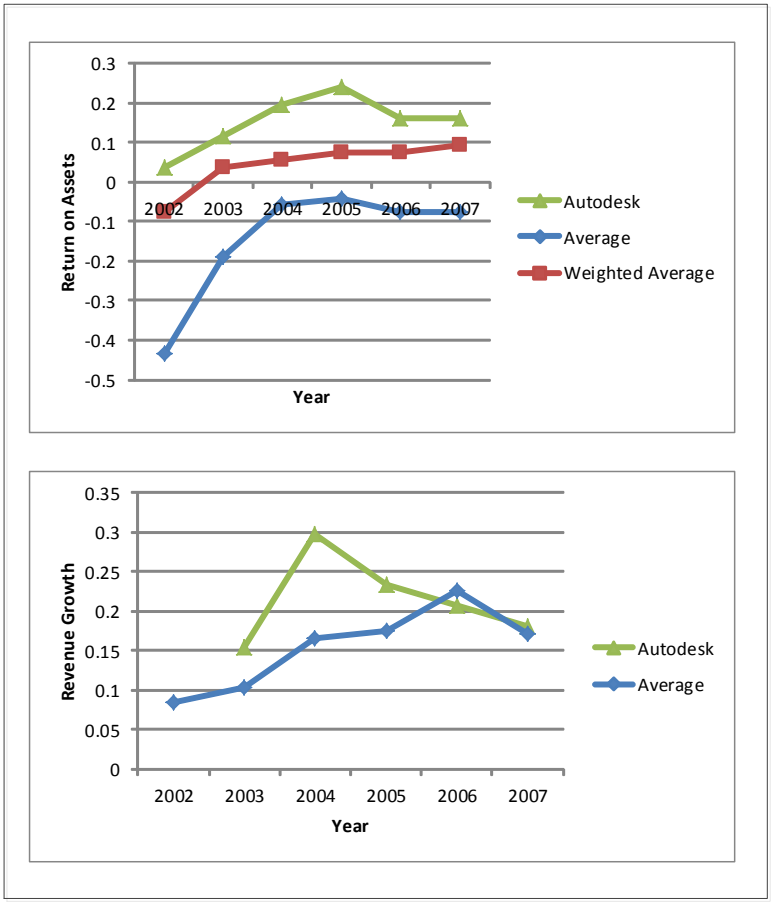

Figure 4.6. Autodesk's profitability and revenue growth over time

Autodesk's technological assets were relatively stable and slightly above the industry's average, as can be seen in **Figure 4.7.** It has allocated 19.5 % - 22.5% of its revenue to the development of its technological assets, which are reflected in its technological competences and capabilities related to its product portfolio, both in the design solutions and the media and entertainment segment. These assets also manifest in the company's R&D infrastructure in US and Canada, where most of its basic research and product development takes place. Autodesk has also developed product enhancements using localization of foreign-market versions.

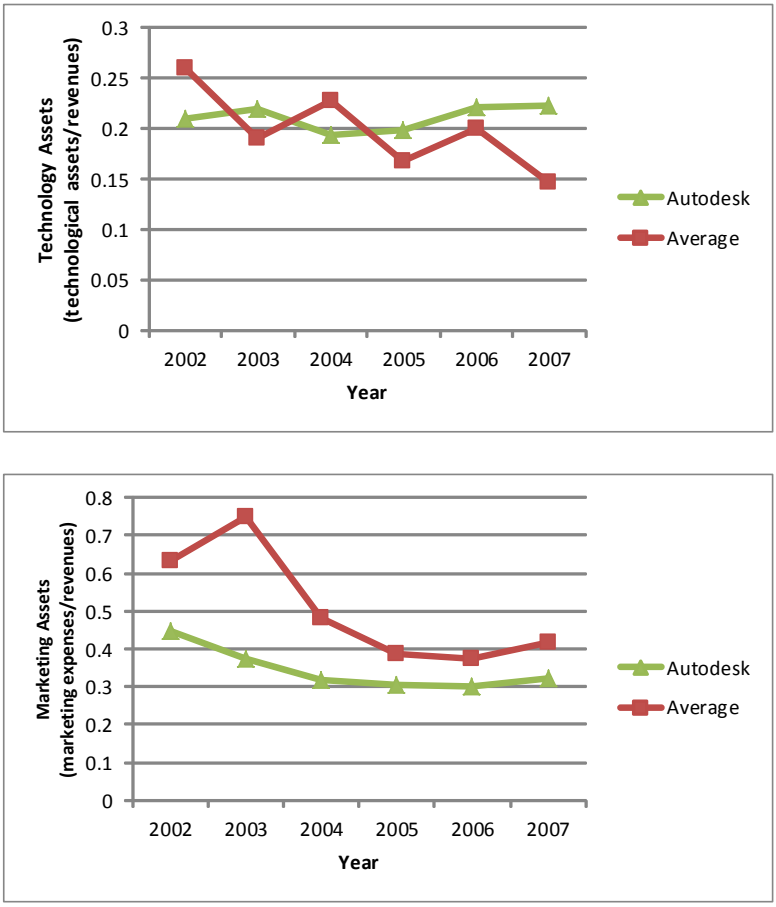

Figure 4.7. Autodesk's technological and marketing assets over time

Autodesk's marketing assets were relatively stable, but relatively speaking below the industry's average, as shown in **Figure 4.7**. Nevertheless, it is a marketing-intensive company that spent almost 45% of its revenues on marketing in the early period under examination, a percentage that continuously declined up to 2006, when around 30% of its revenues was spent on marketing, slightly below the industry's average. This decline may have been caused by the fact that Autodesk started to develop its marketing assets by strengthening its sales through primarily relying on its network of resellers, promoting its competitive position and strengthening its channel support.

As shown in **Figure 4.8,** Autodesk was a central player in the software industry network, and this became more obvious in 2007. We observed that Autodesk's central position in the network of software firms increased in 2007. This significant

peak resulted from Autodesk being connected to other centrally positioned firms (PTC and Microsoft), and a growing network of distributors and reseller partners. Between 2002 and 2007, Autodesk's structural autonomy was relatively stable and stayed high with diverse partners, including distributors, resellers and developers from different segments and industries, as shown in **Figure 4.7**. With approximately 1,700 resellers and 2,900 developers, Autodesk has also extended the range of Autodesk solutions into different segments and regions.

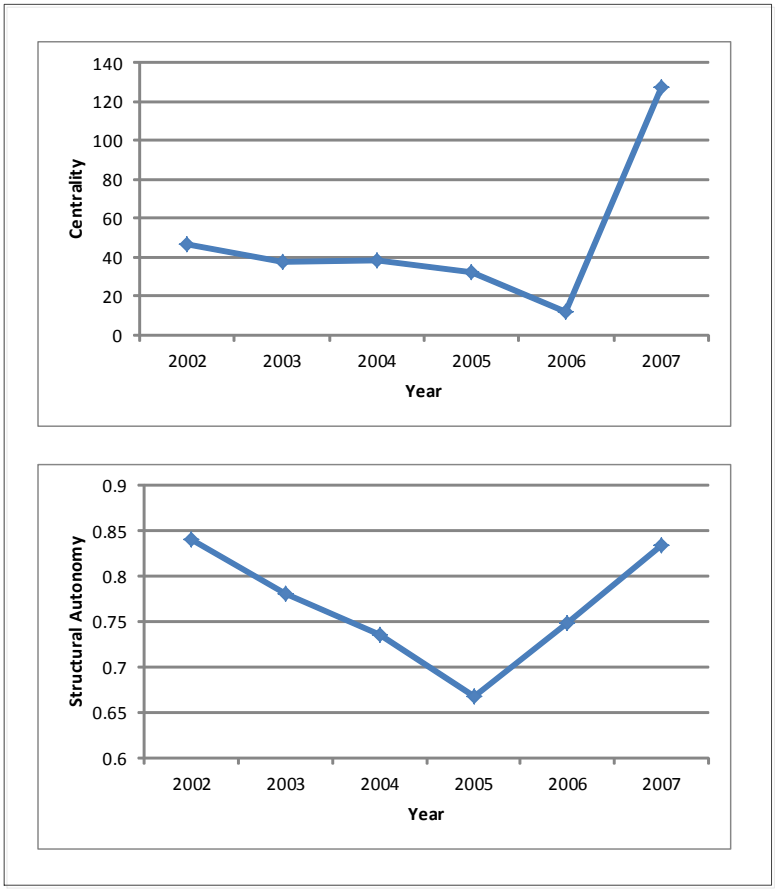

Figure 4.8. Autodesk's centrality and structural autonomy over time

In creating a vision for the future, Autodesk actively invited the participation of its valued customers and partners, with whom it shared its 3-5 years plan. Autodesk also funded programs to support its communities in order to advance its technological trajectories and collective plan for its technological roadmap to the future. This suggests that Autodesk was proactively involved in shaping the future of design technology and has involved its partners and customers in doing this.

Efficiency-related initiatives were created by Autodesk to support this focus by reorganizing the company into market groups that act as independent units, to develop families of products in specific industries and vertical markets and to develop strong developer partner networks. Autodesk also used its platform of partners and its global community of designers, university engineers, and architects to look for ways to improve its technology, by sharing and exchanging knowledge. All of the above suggests that Autodesk has set in place ways to analyze and learn systematically from its partners and customers, and to employ cost efficiency measures that protect the VRIN conditions of Autodesk's resources.

Autodesk maintained an open architecture design that enables customers and third parties to customize its products for a wide variety of highly specific purposes. This allowed Autodesk to be flexible in different technological trajectories in its competitive environment. While Autodesk emphasized the importance of IP protection, it also believed there is a limitation to the legal IP protection and relies on its technological leadership and marketing skills. This suggests that, although Autodesk has used legal mechanisms to protect its IPs, it also depended on the natural barriers that are created by the nature of its technologies and/or from consumer loyalties, i.e., its open architecture design.

To acquire core technological competences, Autodesk preferred using acquisition rather than technological partnerships. It has also used acquisitions to enter the competition in new regions. Price mechanisms, such as appropriately priced products and specially priced software for education programs, have also been used by Autodesk, which may reduce its profit margin but is also likely to increase its market share and/or reach more customers.

To summarize, as an early player in the computer-aided design software market, Autodesk showed a relatively stable increasing trend in its performance in 1998-2007. Its internal resources were relatively speaking below the industry's average and its external resources were above average between 2002 and 2007. Similar to the SAP case, this may indicate that external resources that are used to complement internal resources may positively influence a firm's profitability. In addition, the trends for both internal and external resource were stable in 2002-2007, which indicate a continuous build-up of resources, which was the result of firm's strategic actions that aligned its resources with emerging challenges and threats in its external environment. As shown above, Autodesk engaged in a range of strategic actions, focusing on efficiency and differentiation to that capitalize and leverage both internal and external resources. Its partnership initiatives in exploring cutting-edge technologies and the acquisitions of complementary competencies increased the value of its technological assets. Its focus on efficiency through the differentiation of its technological assets over broader

industry segments and geographies increased its economies of scope and, as such, increased its profitability.

4.3.3. Open Text Corp

The findings of case analysis are shown in **Table 4.7.** Open Text has 16 years' worth of experience in Enterprise Content Management (ECM) software. Open Text operates in enterprise solution software segment, focusing on Enterprise Content Management.

Table 4.7. Summaries of Open Text's case analysis

No.	Dimensions	Remarks
	Attributes	
1.	founded (age)	1991 (16 years as of 2007)
2.	product portfolio	focus on ECM (Enterprise Content Management
3.	positioning	providing products that allow customers to incorporate content from different systems, helping organizations gain more value from their existing IT infrastructure without costly migration
4.	business model	license (31%) customer support (48%) service (21%)
5.	company scope	focus on Enterprise Solutions, especially in the ECM segment
6.	revenue	CAD $ 633,429,000 (US$ 592,437.300)
7.	employees	2,704
	Firm Performance	
1.	profit over time	decreasing trend
2.	growth over time	fluctuating, with dips in 2005 & 2006
	Resources	
1.	technological assets	
	- over time	decreasing trend
	- relationship to firm performance	a decrease profitability followed by a decrease in technological asset
2.	marketing assets	
	- over time	decreasing trend
	- relationship to firm performance	a decrease in profitability, followed by a decrease in marketing assets

Table 4.7. Summaries of Open Text's case analysis (*continued*)

No.	Dimensions	Remarks
3.	centrality	
	- over time	increasing trend, becoming more centralized
	- relationship to firm performance	no association with previous performance
4.	structural autonomy	
	- over time	stable and high
	- relationship to firm performance	no association with previous performance
Strategic Actions		
1.	Enhancing the VRIN conditions	
	- technological leadership	internal resources - continuously innovating on the offerings in the pipeline - 1 new product and 11 new releases/products
		external resources - continued partnerships with Microsoft, Oracle and SAP
	- market leadership	internal resources - strengthening current offerings
		external resources - partnerships to bring products to markets, vendors and system integrators
	- vision	- hosting LiveLink Europe - hosting Summit 2007, where attendees learned about the latest ECM technology, shared success stories, discovered an entire range of innovative solutions
2.	protecting the VRIN conditions	
	- efficiency traits	internal resources - restructuring following acquisitions from the previous years
		external resources - provide a platform to facilitate exchanges among partners - redundant relationships with some companies such as SAP and Microsoft

Table 4.7. Summaries of Open Text's case analysis (*continued*)

No.	Dimensions	Remarks
	- managing dependency	- using acquisitions to acquire core complementary resources - 8 acquisitions since 2002 - policy on partnerships is available with an emphasis on (1) long-term partnerships and (2) access to value-adding competences
	- constant rivalry	no price mechanisms and other aggressive actions were found
	- managing risk	internal resources - rely on legal protection, i.e. combination of IP protection, trade secret, copyright patent, etc.
		external resources - Open Text's offerings revolved around Windows platform

Open Text showed fluctuations in revenue growth in this period, with dips in 2005 and 2006, a peak in 2004 and a deep dip in 2006, to below the industry's average, and starting to take off again in 2007, as shown in **Figure 4.9**. The peaks in 2004 and 2007 were the result of acquisitions made in previous years. In 2003, Open Text acquired four companies. The acquisition of Hummingbird in 2006 also boosted growth in 2006 and 2007. A decreasing trend in profitability was observed for the period of 2002-2007, as shown in **Figure 4.9**.

Open Text's technological and marketing assets showed decreasing trends over the period of 2002-2007. As shown in **Figure 4.10**, we can observe a decreasing trend in Open Text's technological assets, as reflected in its R&D intensity. Open Text spent, on average, 15% of its revenue on R&D related activities. In 2007, R&D expenses increased, due to an increase in headcount at Open Text, but this was compensated by an increase in the revenue. The company's R&D activities were directed at enhancing existing products and introducing new products.

Open Text's technological assets were related to its technological competences and capabilities in the context of content management, i.e., its Enterprise Content Management (ECM) and connectivity solutions. The acquisition of Hummingbird, in October 2006, added Open Text's technological competences for meeting the challenges of integrating heterogeneous legacy environments with modern Windows desktops. As a result of these efforts, Open Text was recognized for its innovative products in knowledge and content management tools. Open Text's marketing assets showed decreasing trend over the years, from 17% in 2002 to 11% in 2007 as shown in **Figure 4.10**. Open Text had below industry average

marketing assets. The result of this spending could be seen in the Open Text sales force, the trade shows it organized and attended, and the brands or positioning of Open Text as a provider of enterprise content management solutions.

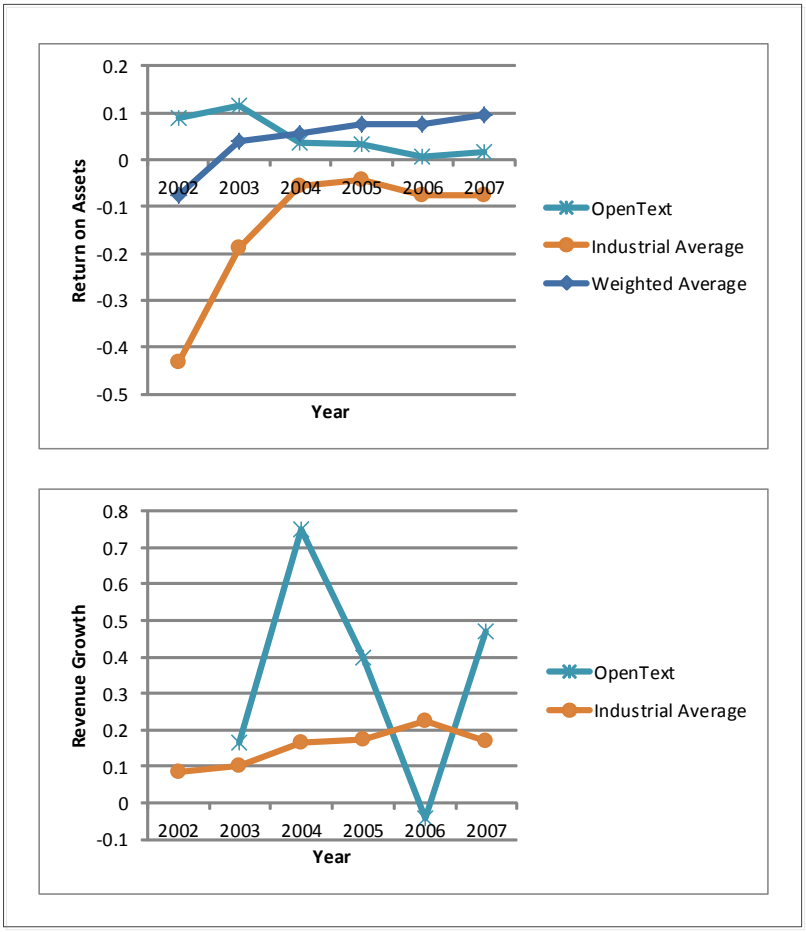

Figure 4.9. Open Text's profitability (return on assets) and revenue growth over time

With the aim of accessing complementary resources, i.e., market or technology, Open Text built partnerships with different types of organizations. Open Text became more centralized over time and gained a stable autonomy position, as shown in **Figure 4.11**. In 2006, these two positions started to improve. Open Text was also a structurally autonomous firm, which is the result of it having accumulated partnering initiatives in its different industry domains. The company's partners were divided among firms in different industry segments or applications.

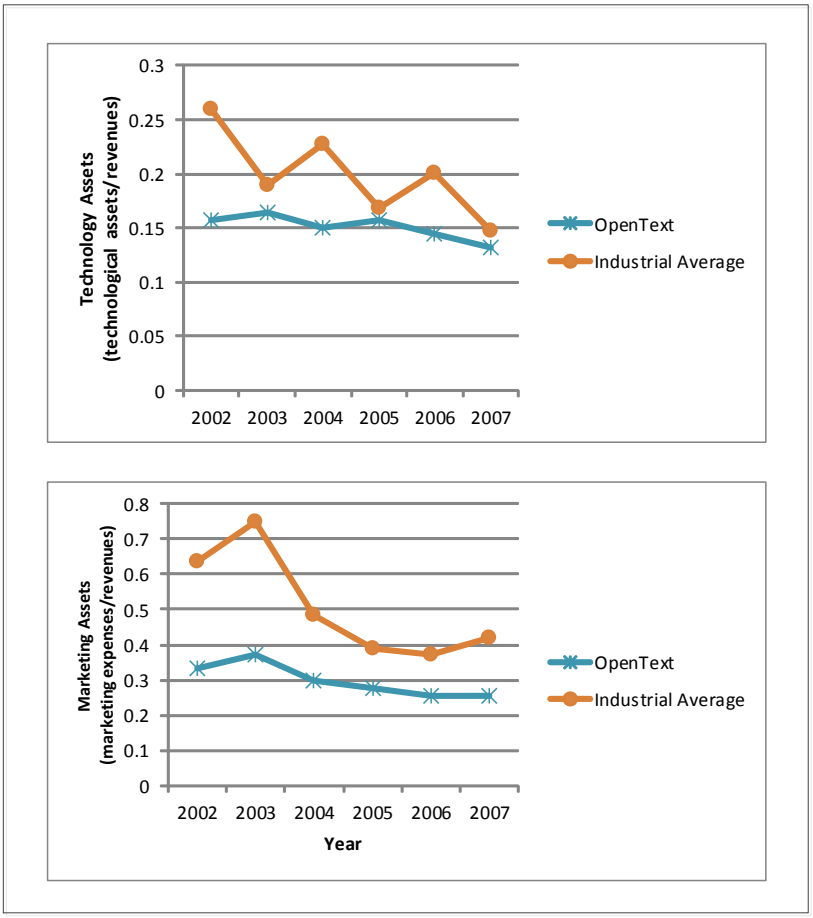

Figure 4.10. Open Text's technological and marketing assets over time

We saw that Open Text's strategic actions had an efficiency focus designed to produce strong operating profits between 2000 and 2007. This focus on efficiency was driven by the pressure of the economic conditions and Open Text's organizational needs, resulting from a restructuring process that took place between 2000 and 2007, which made it difficult for Open Text to focus on differentiation. However, it also continued its investment in new product innovation, both through acquisitions and partnerships. At the end of the 1990s, Open Text had a focus on differentiation, through capitalizing on the opportunities in the expanding Internet software and e-business markets, through internal development and also through the acquisition of complementary technology (Annual Report, 1998; 1999). Following the end of the dot.com era, Open Text focused on efficiency and expanded its product offerings to include major vertical

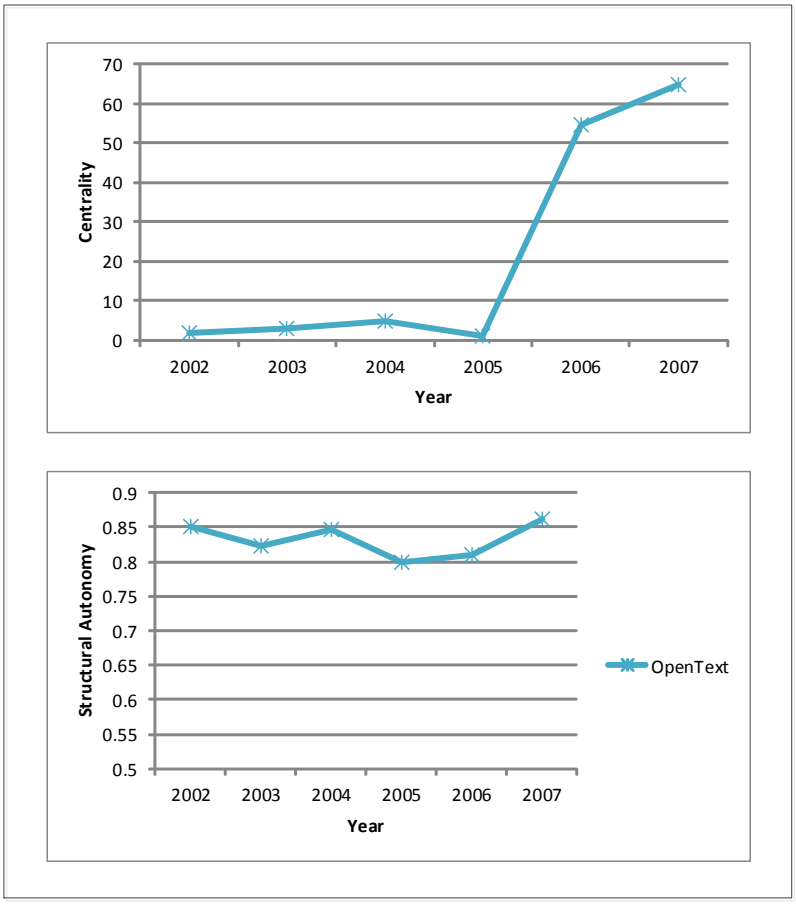

Figure 4.11. Open Text's centrality and structural autonomy over time

applications in the pharmaceutical industry, government, financial services, education, healthcare and energy (Annual Report, 2003). We observed decreasing performance for Open Text between 2000 and 2006, which can be attributed to the weakening economy in the early 2000s due to the end of the dot.com era. In 2007, Open Text's performance improved, which can be attributed to the integration of Hummingbird's competences, which were acquired in 2006. This acquisition increased the functionality and scope of Open Text's ECM offerings (Annual Report, 2007; 2008). With the acquisition of Hummingbird, Open Text became the largest independent provider of Enterprise Content Management (ECM) software, which increased its customer-base and market presence, and gave the company access to new markets (Letter to stockholders, 2007). With a focus on producing strong operating profits, Open Text collaborated with important strategic partners. Open Text partnered with SAP, which resells Open

Text products. Its partnership with Microsoft provided the company with opportunities to expand its markets by building solutions on top of Microsoft SharePoint (Letter to Stockholders, 2007).

To summarize, Open Text engaged in a range of strategic actions, using varying degrees of intensity. Open Text proactively looked for a new fit in its external environment, using both its internal resources, technological and marketing assets, and external resources, which were accessed through its partnerships. Most partnerships were aimed at achieving enhanced interoperability and less on developing cutting-edge technology in Open Text's domain. Although tools for managing Open Text's partnerships were available, they were aimed at ensuring the availability of resources and solutions for its partners and customers, and less at the way Open Text manages knowledge transfer among its partners and makes the best use of this knowledge. Having repeated relationships with several companies underscores the value Open Text places on trust in partnerships. Open Text's solutions revolved around the Microsoft platform, a stable platform to align with, which in turn provide stability to Open Text's competitive landscape. Acquisitions were made to acquire core competences, and no other aggressive actions or pricing mechanisms were found in the study.

Open Text showed a decreasing trend in its profitability and fluctuating revenue growth in 1998-2007. Its internal resources were below the industry's average and its external resources were above average. This may indicate that external resources that are used to complement internal resources may positively influence the firm's profitability. However, the trends of both internal and external resources were decreasing in 2002-2007, which indicates that a build-up of resources did not materialize. This may be the result of the firm's strategic actions, which are not aligned well with its resources and external environment. Focusing on efficiency-related actions reduced Open Text's flexibility in leveraging its internal and external resources, which may hamper its profitability.

4.3.4. CA, Inc

The findings of the case analysis are shown in **Table 4.8.** Founded over 33 years ago, CA is one of big players in the pre-packaged software industry. Operating in the enterprise solution software segment, CA offered a broad range of products in the field of enterprise information technology management (EITM) Software. With this, CA has continued to pursue its vision of "*Unifying and simplifying complex IT management for greater business results*". CA's product offerings had three main focuses: to govern, manage and secure IT operations. CA provides enterprise solutions and mass market software.

Table 4.8. Summaries of CA's case analysis

No.	Dimensions	Summaries
	Attributes	
1.	founded (age)	1974 (33 years)
2.	product portfolio	broad product offerings in enterprise Information Technology Management (EITM) software
3.	product positioning	unifying and simplifying complex IT management for greater business results
4.	business model	license (88%) maintenance (9%) professional fees (3%)
5.	company scope	enterprise solutions and packaged mass market software
6.	revenues	US $ 4,277,000,000
7.	employees	13,700
	Performance	
1.	profit over time	increasing trend and below average profitability
2.	growth over time	Fluctuating and below average
	Resources	
1.	technological assets	
	- over time	decreasing trend along industry average
	- relationship to firm performance	positive association between firm performance in the previous year and technological assets
2.	marketing assets	
	- over time	relatively stable and below average
	- relationship to firm performance	positive association between firm performance in the previous year and marketing assets
3.	centrality	
	- over time	decreasing trend in the beginning, but taking off in 2007
	- relationship to firm performance	positive association between firm performance in the previous year and central position
4.	structural autonomy	
	- over time	stable and above average
	- relationship to firm performance	positive association between firm performance in the previous year and marketing asset

Table 4.8. Summaries of CA's case analysis (*continued*)

No.	Dimensions	Summaries
Strategic Actions		
1.	Enhancing the VRIN conditions	
	- technological leadership	internal resources - continued releases of new products,20 new releases - research labs drive research in advanced technologies, with a return horizon of more than two years.
		- Center "emerging business opportunities by which incubator projects are manage for ones that go beyond existing capability solutions". - CA's Council for Excellence to lead innovative projects, which set the pace for true innovation - R&D intensity was reduced to 12 % in 2007 compared to 21% in previous year
		external resources - through its research centers, CA partner with a range of established organizations (universities, academia, professional association, industry standard bodies, customers and partners to explore novel products and emerging technologies - CA's technological partners enable the value-added integration of CA's products, which provide CA's technologies/products with deep support for leading platforms and rich solutions
	- market leadership	internal resources - established new business unit that focused on specific markets - expanded its sales department in specific markets - marketing campaign and strengthening its brands through its CSR
		external resources - CA focused on creating strong and durable partnerships with key customers - extending its broad base of partners through network of value-added partners, OEMs, distributors, global system integrators - initiated industry-leading channel empowerment programs to strengthen CA's marketing infrastructure

Table 4.8. Summaries of CA's case analysis (*continued*)

No.	Dimensions	Summaries
	- vision	- created "Customer Group", with which CA also sought out opinions and advice from its customers groups - together with marketing campaigns events, CA shared its vision with its communities in event like CA World
2.	protecting the VRIN conditions	
	- efficiency traits	internal resources - restructuring by reducing workforce and consolidating its global facilities - revising its incentive compensation plan - shifting its CA sales model in certain countries from a direct sales force model towards an indirect, partner-led model - divesting its assets by selling its subsidiaries
		external resources - using its network of global partners to improve market access and the efficient and effective delivery to end customers - providing CA Partner portal
	- managing dependency	- CA chose acquisitions rather than technological partnerships - CA acquired 8 companies within 3 years
	- constant rivalry	- no price mechanism or other actions in respond to constant rivalry from competitors
	- managing risk	internal resources - CA relied on legal protection, (i.e. combination of IP protection, such as trade secrets, copyrights, patents, etc.) - while acknowledging the cost of litigation, CA chose to sue companies that infringe on its property rights
		external resources - CA positioned its product as open and flexible solutions that do not have a preferred hardware, software or operating system platform agenda

CA showed low performance in 2000 – 2003, before taking off again in 2003. Over the years, CA's revenue growth has fluctuated and was below industry average, as

shown in **Figure 4.12.** Growth fell in 2005 and 2006. CA also showed a stable increasing , but below the industry's average, trend in terms of its profitability in the period of 2002-2007, as shown in **Figure 4.12**. This was caused by a slowdown in the global economy during those years. In addition, as the results of CA's operations in the fiscal years 2000-2003, CA faced litigation from the US government, which significantly influenced its growth and profitability.

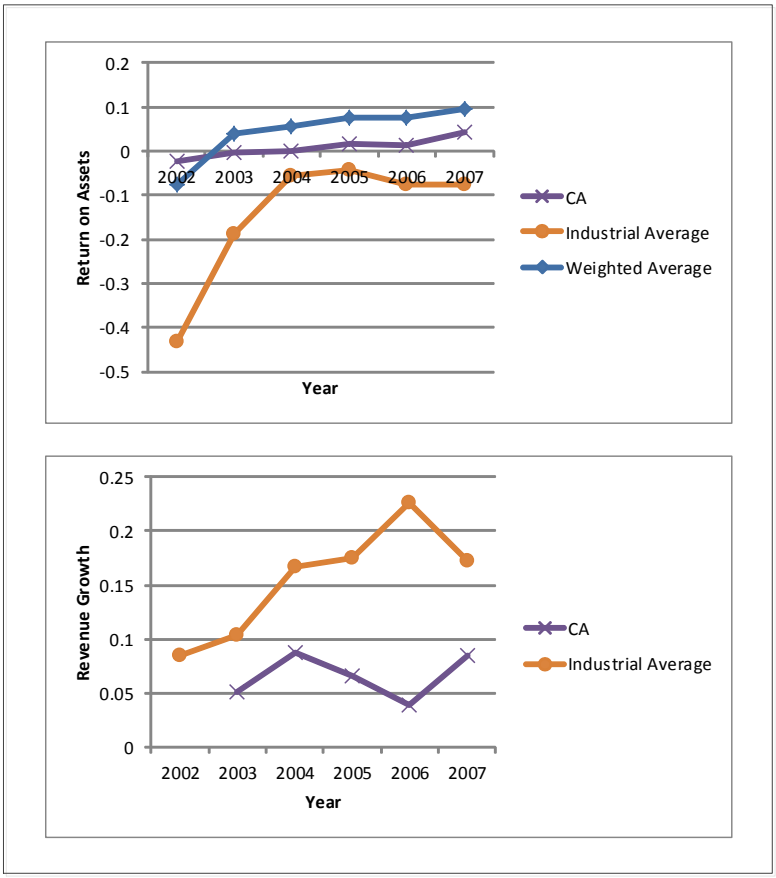

Figure 4.12. CA's profitability (return on assets) and revenue growth over time

The company's technological assets show a decreasing trend similar to the industrial average, from 21% in 2002 to 12% in 2007, as shown in **Figure 4.13**. This decline over the years was the result of a continued focus on transferring developments to lower cost regions and savings through restructuring activities (CA's Annual Report, 2008). The technological innovations of CA were the results of the accumulated efforts of approximately 5,900 engineers globally in Australia, China, the Czech Republic, Germany, India, Israel, Japan, the United Kingdom and the United States.

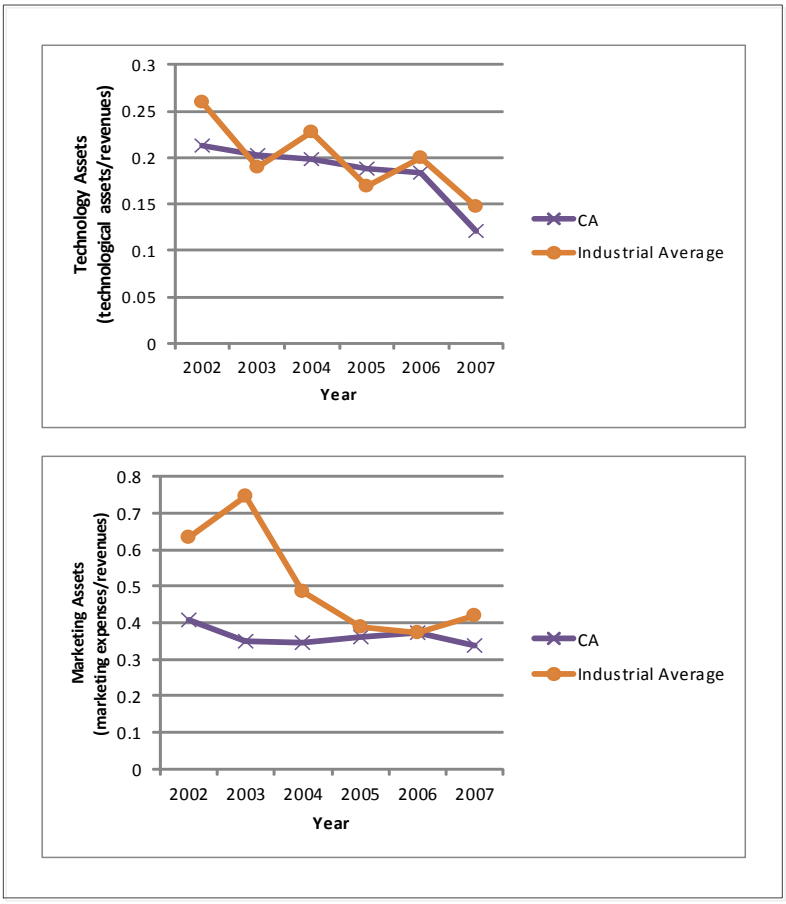

Figure 4.13. CA's technological and marketing assets over time

The company's marketing assets, as reflected in the ratio of marketing expenses to revenues, show a relatively stable trend and below the industry's average, from 41% in 2002 to 34% in 2007, as shown in **Figure 4.13**. The decline in this marketing assets can be particularly attributed to reduced personnel and office costs and to cost reductions and a restructuring plan in 2006 which might be influenced by a slowdown in the global economy and litigation from the US government. The investment/development of marketing assets was aimed at improving the position and scope of CA's offerings through its sales force, channel partners, customer training program, and/or other corporate and business marketing programs. This resulted in a worldwide sales organization that includes branches and subsidiaries located in 46 countries, with 3,700 sales and sales support personnel.

In 2007, CA again became more centrally positioned in the network. As shown in **Figure 4.14**, in 2000, CA was initially centrally positioned in its industry network,

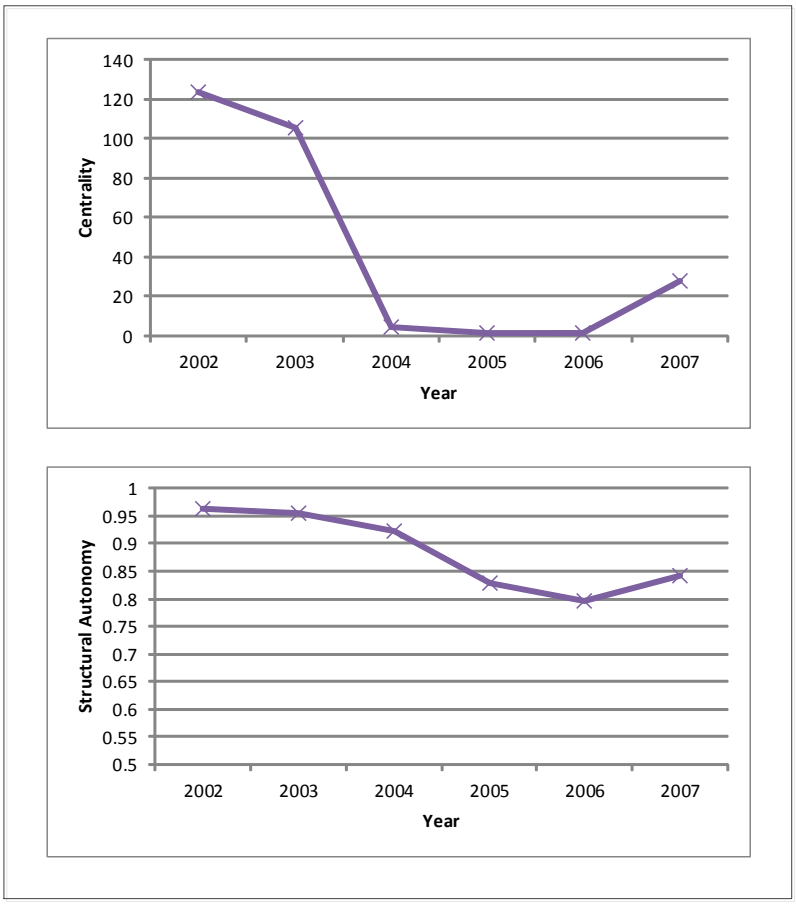

Figure 4.14. CA's centrality and structural autonomy over time

but then experienced dips between 2004 and 2006 and started to take off again in 2007. The dips can be attributed to the crisis at CA between early 2000 and 2004, when CA had experienced slow growth, and faced litigation as a result of fiscal mismanagement, which made it difficult to create strategic partnerships or connect to important partners. The increase in CA's centrality in 2007 can be attributed to a strategic partnership with HCL Technologies in product development and research and customer support associated with the Internet security business. In 2007, HCL Technologies was centrally positioned and this improved the position of CA in the network. A firm's partnerships cannot be easily dissolved and developed since, to some extent, the control also resides on the side of a firm's partners. In 2002 – 2003, CA experienced losses, which influenced the propensity of other firms with which it partnered, and this was reflected in the reduction of CA's central position in the following years. While CA's central

position had fluctuated, CA's structural autonomy had been relatively stable and has stayed high over 2002 – 2007, as shown in **Figure 4.14**. With its network of value-added and distribution partners and OEMs, CA worked with diverse partners that are not well connected. We can see that CA has diverse partners, as shown by the high level of structural autonomy over the years. This position was related to CA's partnering activities with respect to improving its product reach, complementing its expertise in niche areas and providing fulfilment and distribution.

The below average performance of CA in 2000 – 2003 and the weakening economic conditions and changes in its business model reduced its profits, which required the firm to strengthen its operational position. During this period, CA changed its business model and faced a US government litigation, due to its accounting practices. As reflected in its 2003 annual report, CA focus on efficiency since 2002. In 2003, CA also realized that it needed to shift to enterprise software, with an emphasis on dealing with multiple solutions from multiple vendors and challenges to integrate the system (Annual Report, 2003). Following this shift, CA responded by focusing on what it did best and developed its Enterprise Information Technology Management (EITM) strategy in 2005. In 2007, CA focused on efficiency improvement by reducing costs through restructuring and moving to a partner-led model in potential markets (Letters to stockholders, 2008). CA's revenue growth was positively influenced by three factors: (1) growth in the international business, (2) an improved ability to manage the existing portfolios, and (3) an improved ability to sell and install new software licenses (Letter to stockholders, 2008).

To summarize, CA experienced an increasing trend in profitability, albeit below the industry's average between 1998 and 2007. CA also had a fluctuating and below average revenue growth in 1998-2007. Its internal resources were below the industry's average and its external resources were above average. This may indicate that external resources that were used to complement internal resources had a positive influence on its profitability. However, the trends of both the internal and external resources were decreasing in 2002-2007, which indicates that a build-up of these resources did not materialize. This may be the result of the firm's strategic actions, which did not well align its resources with emerging opportunities and threats in the external environment. The wrong-doing in the early 2000s had a serious impact on CA's performance. Similar to Open Text, focusing on efficiency-related actions reduced CA's ability to leverage its internal and external resources, which may have hampered the build-up of its resources and affected its profitability.

4.4. Cross-case analysis

In this section, we discuss a comparison across the four contrasting cases, to identify unique patterns in the firms' strategic actions that might contribute to differences in firm performance. We did cross case comparisons for each factor: (1) firm performance over time, (2) attributes, (3) resources over time and (4) strategic actions.

4.4.1. Firm performance over time

Comparing the four firms, we can observe there are differences in terms of their performance over time, as shown in **Table 4.9** and **Figure 4.15**. SAP and Autodesk experienced an increasing trend, both in terms of profit and of growth, while Open Text showed a decreasing trend in profitability and fluctuating growth. The peaks in revenue growth in 2003-2004 and 2006-2007 were the result of acquisitions made in those years. CA showed an increasing trend in profitability, but it was below the industry average. These differences in stability of firm performance may have played a role in the relationship between firm resources and firm performance in the year 2007.

Table 4.9. Cross-comparisons on firm's performance over time

No	Dimensions	High performance		Low performance		Observed Differences between high and low performance
		SAP	AUTODESK	OPEN TEXT	CA	
1.	profit over time	increasing trend	increasing trend until 2005 and stable afterwards	decreasing trend	increasing trend but below average profitability	Yes
2.	growth over time	increasing trend with slight decrease in 2007	above average with a peak in 2004	fluctuating, with dips in 2005 & 2006	fluctuating and below average growth	Yes

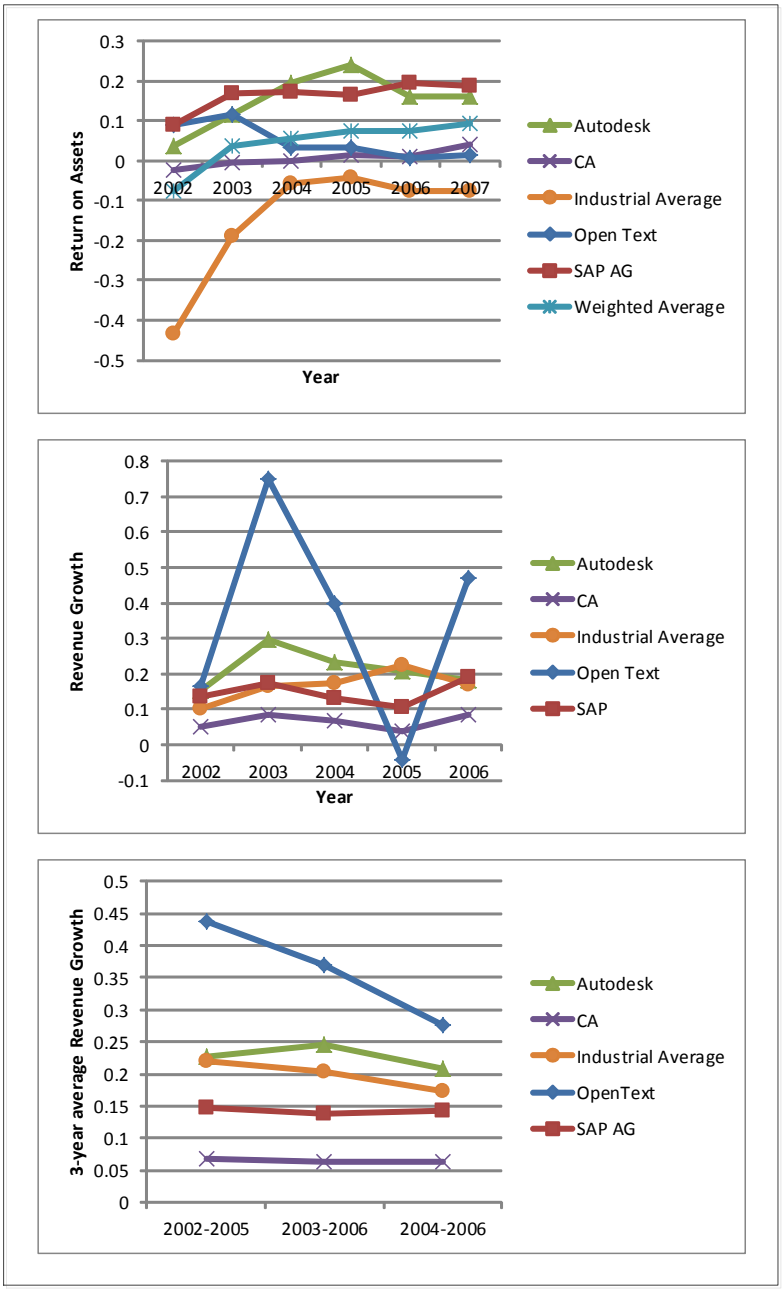

Figure 4.15. Comparisons of firms' performance over time

4.4.2. Firm attributes

We observed the firms' attributes, in terms of their size, product scope, positioning and revenue streams. Comparing the attributes (see **Table 4.10)**, we can see differences in size (in terms of revenues or the number of employees), although all firms are categorized as big firms. However, we cannot observe differences in size (in terms of revenue or number of employees) and age between the high and low performance firms. Although bigger and older firms indicate well-oiled machines, where all routines are in place and, thus, could show higher levels of profitability, our cross-case analysis cannot confirm it. We observed that, while CA has the same age and size as SAP, its performance levels were lower. The same applies to firm size in terms of revenues and the number of employees. Thus, we cannot conclude that firm size and age influence a firm's profitability.

The four firms in our case study are publicly-listed firms categorized as pre-packaged software firms (standard industry code SIC 7372). SAP, Autodesk and Open Text had focused product portfolios compared to CA. SAP and Open Text focused on providing enterprise software, while Autodesk focused on providing packaged mass-market software. CA worked on both enterprise solutions and packaged mass-market software, supporting its EITM vision. While both SAP and Open Text had focused product portfolios in enterprise solutions, SAP had a wider variation than Open Text in terms of firm segments, industry-specific functionality and delivery model. Having said this, SAP had a higher level of differentiation within its market segment, which may contribute to its higher level of profitability compared to Open Text. Differentiation within its market segments allows a firm to divide high development costs among more products or demands (Hoch et al., 2000), increasing the return on its development investment. In a different segment from SAP, Autodesk also showed focused product offerings, with a high differentiation in industry-specific functionality, which may have an influence on firm performance, since it allows firms to enjoy the economy of scope by efficiently dividing their resources over different similar products.

In **Chapter 3**, we indicated that revenue streams may influence the relationship between a firm's resources and its performance. As we can see in **Table 4.10,** there were no differences between the revenue streams of the high and low performance firms. SAP's business revenue stream was composed of an almost equal distribution between sale of licenses (35%), support (37%) and service (28%). Autodesk's revenues mostly came from licensing its products (82%) and maintenance (18%). Open Text's revenues mostly came from licensing its products (88%), maintenance (9%), and professional fees (3%), while CA's business model emphasized customer support and maintenance, which made up 48% of its revenues in 2007, followed by licensing (31%) and services (21%). Based on this,

Table 4.10. Cross-comparison on firm's attributes

No	Dimensions	High performance		Low performance		Observed Differences between high and low performance
		SAP	AUTODESK	OPEN TEXT	CA	
1.	Founded (age)	1972 (35 years)	1982 (25 years)	1991 (16 years)	1974 (33 years)	No
2.	product portfolio	focus on enterprise application software	design software and services companies with two divisions (1) Design Solutions Group and (2) Media and Entertainment Division	focus on ECM (Enterprise Content Management	broad product offerings in enterprise Information Technology Management (EITM) software	No
3.	positioning	flexibility, business insights, industry specific content, and enterprise specific solutions	providing products with solution that provide flexibility andindustry specific solutions, and help customers to innovate, reduce design time and costs, and improve their productivity and profitability.	providing products that allow customers to incorporate content from different systems, helping organizations gain more value from their existing IT infrastructure without costly migration	unifying and simplifying complex IT management for greater business results	No
4.	revenue streams	license (35%) customer support (37%), service (28%)	license (82%) maintenance (18%)	license (31%) customer support (48%) service (21%)	license (88%) maintenance (9%) professional fees (3%)	No
5.	company scope	focus on enterprise solutions with variation in the delivery and industry-specific needs	packaged mass market software	focus on Enterprise Solutions, especially in the ECM segment	enterprise solutions and packaged mass market software	Yes
6.	revenue (in million)	EUR 10,171 (US $ 13,364)	US$ 2,171	CAD $ 633(US$ 592)	US $ 4,277	No
7.	Employees	43,861	7,300	2,704	13,700	No

we conclude that a firm's revenue stream may have no influence on the relationship between its resources and performance, as previously suggested by Cusumano (2008).

4.4.3. Firm resource configurations over time

Although we chose firms with similar resource configurations in the year 2007, the trends over time may provide a further explanation. It may help us understand the influence of a firm's resources on its performance. In **Figure 4.16**, we observe different trends of resource configuration over time among the high performing firms (i.e., SAP and Autodesk), compared to those that do not (i.e., Open Text and CA).

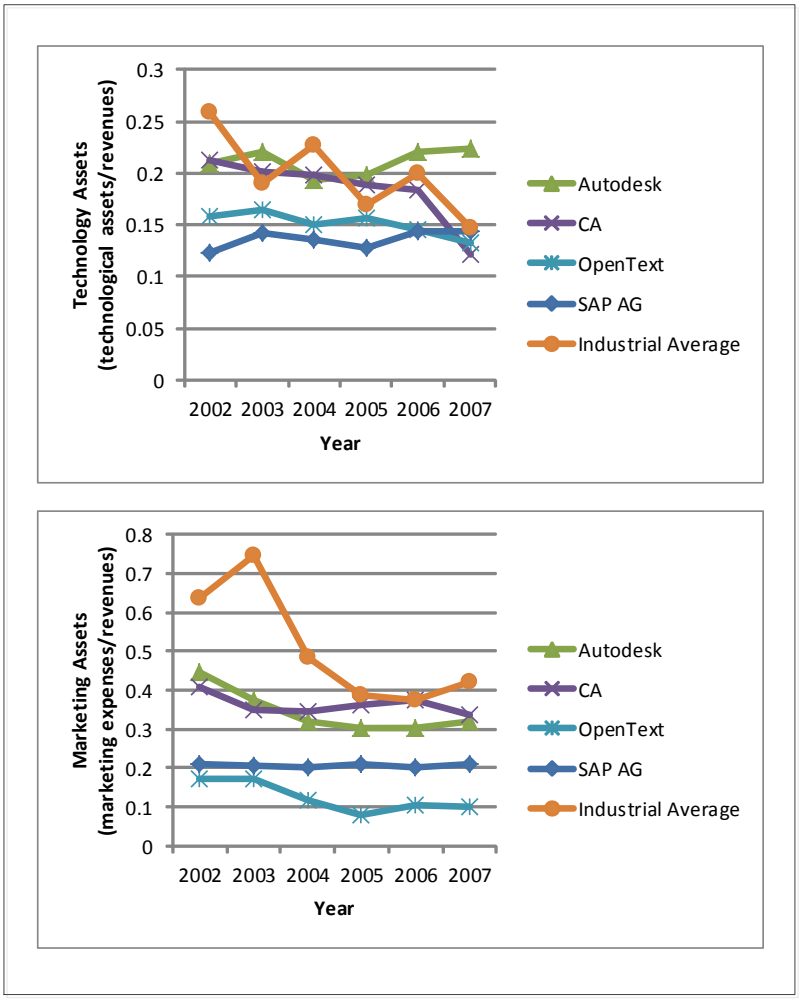

Figure 4.16. Cross-comparison of firms' internal resources over time

In 2007, all firms are categorized as having high levels of technological assets in the software industry, although they showed different trends during 2002 – 2007. The two high performing firms had relatively stable trends, while the other two showed decreasing trends in terms of their technological assets. As for marketing assets, the firms had relatively stable marketing assets, while the others showed less stable trends.

We observed centrality and structural autonomy as proxies for external resources. As shown in **Figure 4.17.**, the high performing firms showed relatively stable centrality over time, compared to the other firms. As for structural autonomy, no significant difference was observed.

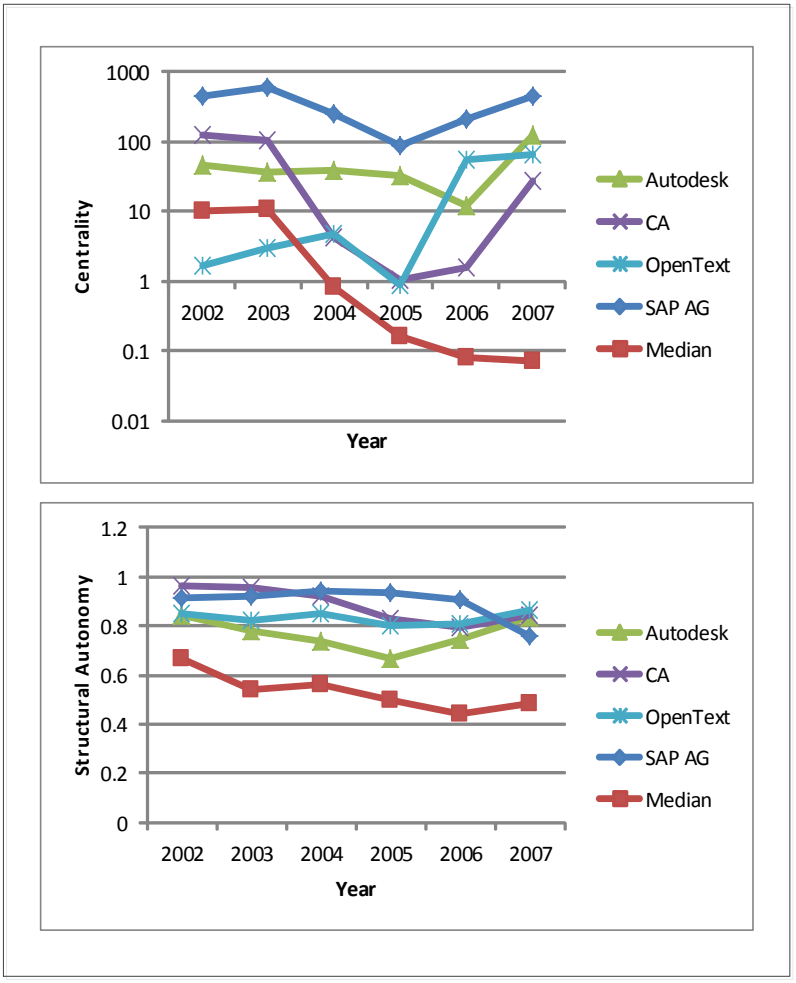

Figure 4.17. Cross-comparison of firms' external resources over time

We also observed in terms of the resource configuration over time between high and low performing firms as shown in **Figure 4.17**. Open Text and CA showed decreasing trends in their technological assets, while SAP and Autodesk showed stable trends. SAP and Autodesk showed a relatively stable level of centrality over the years compared, to Open Text and CA. Open Text became more centralized in 2007, which is similar to CA, which took off in 2007, after a decreasing trend. As for SAP, we can observe that in 2007 there was a dip in its structural autonomy, although it remained still on a similar level as Open Text's. As shown in **Table 4.11**, we observed there is a difference in terms of technological assets over time, but not in terms of marketing assets and external resources.

This resource configuration may indicate that firms compensate internal resources with external resources, which may have a positive effect on firm performance. Firms may use their network to complement their internal resources, which may increase the efficient use of their internal resources and the value of their products. As found in Chapter 3, the interaction between a firm's structural autonomy and technological assets has a positive effect on the firm's profitability.

Table 4.11. Cross-comparison on firm's resource configuration over time

No	Dimensions	High performance		Low performance		Observed Differences between high and low performance
		SAP	AUTODESK	OPEN TEXT	CA	
1.	technological assets	relatively stable and below average	relatively stable and above average	decreasing trend and below industry average	decreasing trend along industry average	Yes
2.	marketing assets	relatively stable and below average	relatively stable and below average	decreasing trend and below average	relatively stable and below average	No
3.	centrality	stable,with a dip in 2005	relatively stable in the beginning and a sudden peak in 2007	increasing trend, becoming more centralized	decreasing trend in the beginning but taking off in 2007	No
4.	structural autonomy	stable and high, with a dip in 2007	stable and high with a dip in 2005	stable and high	stable and above average	No

Another important observation has to do with the stability of resources over time, which may influence a firm's performance, since it allows the firm to take strategic

actions to enhance and protect its competitive advantage. In addition, stability indicates a continuous build-up of resources as a result of its strategic actions over time. The positive influence of those strategic actions on firm performance indicates a good fit between its resource configuration and emerging opportunities and threats in the external environment.

4.4.4. Comparisons of the firm's strategic actions

We argue that high performing firms take strategic actions to enhance and protect the VRIN conditions of its resources. As shown in **Table 4.12**, we observe that the firms, SAP and Autodesk, acted strategically in a way that differentiates them from the other firms, Open Text and CA. This indicates that a firm's strategic actions may influence the relationships between its resources and performance.

4.4.4.1. Enhancing the VRIN conditions

In advancing product leadership, SAP and Autodesk explored cutting-edge technologies using their internal as well as external resources. SAP and Autodesk used partnerships to develop these cutting-edge technologies, for example SAP with Co-Innovation Lab (COIL) and Autodesk with its "Autodesk Research", "The Autodesk Research Donation Program" and the "Research Internship Program". These initiatives supported research into future technological breakthroughs. Both SAP and Autodesk also gave recognition to individuals and companies delivering significant contributions to the development of the technologies supporting their product leadership. Open Text and CA used more internal resources to explore cutting-edge technologies. Open Text's collaborations were more related to commercialization, i.e., having more applications to enrich its product offerings, rather than technology or co-innovation. In addition, CA appeared to focus more on its internal than its external resources in building advanced technologies. Its technological partnerships were focused more on achieving integration and richer solutions. CA's product leadership was supported by its internal resources, which provided control over its technological development. Rather than develop its resources together with other firms, CA chose to develop incubator projects for projects that went beyond its capability solutions. Moreover, it appeared that CA's technological partnerships were aimed at realizing a better integration and richer solutions for CA products/technologies, rather than at proactive co-innovation.

Firms that perform well also have similarities when it comes to the use of their partners to enhance their product leadership. While each firm develops technological partnerships with various firms to increase interoperability and integration, firms that perform well in particular proactively develop partnerships

Table 4.12. Cross-case analysis on firm's strategic actions in enhancing the VRIN conditions of a firm's resources

No	Dimensions	High performance		Low performance		Observed Differences between high and low performance
		SAP	AUTODESK	OPEN TEXT	CA	
1.	product leadership	varied initiatives in developing internal infrastructures. partnerships with prominent players for cutting edge technologies and nurturing innovation	enhance current technological leadership and explore cutting-edge technologies driven by internal R&D and collaboration with partners	continued partnerships with main partners to ensure integration and extension of product offerings	varied initiatives in its internal organization and use of partnerships that focus more on providing integration and richer solutions. exploring cutting-edge technologies or advanced technologies was done using its internal resources rather than through partnerships.	Yes
2.	market leadership	varied initiatives in developing internal infrastructures partnerships with firms in different regions and domains	varied marketing initiatives with the use market groups and partners to extend its product offerings	less varied marketing initiatives partnerships with firms in different regions and domain	focused unit for specific market and using partners to extend its product offerings	No
3.	vision	varied initiatives to set visions in its domain and use its ecosystems to create new developments	proactively shaping the vision and share its communities	involved and followed events to create visions but no indication of sharing short-term and long-term plan	using its communities of partners and customers to gather opinions and advice and share its vision	Yes

in cutting-edges technologies (Schilling, 1998; Lavie 2007; Venkatraman et.al, 2008). They appear to nurture and explore new trajectories of technological advancements or new technology discoveries by engaging in a diverse mixture of collaborative efforts. By contrast, CA's and Open Text's collaborations appeared to be related more to commercialization, i.e., having more applications enriching their product offerings, rather than technology or co-innovation. This may influence the relationship between their resources and performance. Partnerships that are developed based on the continuous search for information will increase the diversity of that information and provide firms with new ways to reconfigure their current resources. This is also supported by empirical research (e.g., Koka & Prescott, 2008; Venkatraman et.al, 2008).

In terms of market leadership, all firms showed similarities in their emphasis on the importance of partners for their market initiatives. There were differences in the diversity of those initiatives. Autodesk's marketing initiatives include mass marketing techniques, outlets for Autodesk product exposure, award and rewards, Autodesk Preferred Industry Partner Program, a network of developers, resellers and distributors. All its initiatives are directed at creating efficient and effective marketing techniques, but they also enable learning and they spark creativity. SAP has used its market groups and partners to increase the presence of its products. CA invested in new business units and sales departments in specific markets, brand awareness programs, and partnerships to extend its product scope. Open Text showed the lowest level variety in its marketing initiatives, but claims that, in addition to its internal efforts, it also uses partnerships to complement its marketing initiatives.

Although all four firms consider long-term vision to be important, they put a different emphasis on how they involve their partners. SAP and Autodesk actively involve and sponsor their entire ecosystem in shaping the future of their product offerings and the complementary technologies around them. For example, SAP provided the "Industry Specific Solution Map", which specifically addresses SAP's focus, while also inducing participation and knowledge exchange between its partners. In a different way, Autodesk shared its 3-5 years plan with its valued customers and partners, and funded programs to support its communities in advancing its collective technological roadmap. CA emphasized the role of its sales forces in trend recognition, and used its marketing events in to showcase and address challenges in the evolution and delivery of its Enterprise Information Technology Management (EITM) vision. In addition, CA also tapped into the knowledge of its external partners regarding the future of CA solutions and business. Open Text showed the least variety in terms of creating a proactive vision. However, even Open Text showed a tendency to share its vision with

partners and to learn from each other. Thus, we observe that there is subtle difference when it comes to strategic actions, with firms that perform well taking proactive actions to set their vision.

4.4.4.2. Protecting the VRIN conditions

In addition to the efforts designed to enhance the VRIN conditions of their products, firms also need to continuously protect the VRIN conditions of their resources. As observed in **Section 4** and summarized in **Table 4.13**, there are differences in terms of a focus on efficiency, managing dependency, managing risks and responses to constant rivalry.

All firms show similar internal efficiency-related efforts, in the form of workforce reduction, reorganization and divestment, as shown in **Table 4.13**, in particular, which had an aggressive efficiency program in an effort to recover from the internal crises it experienced in 2000-2004. Differences can be observed in the efficiency-related focus of firms in relation to their external resources. The firms that performed well used their partner platforms as a tool that not only pools all resources, but also facilitates an efficient interaction among their abundant partners to absorb knowledge, analyze and provide solutions to partners. With its expertise in enterprise application software, SAP created platforms that can facilitate an efficient interaction among its large scale partners, which not only benefits the company, but also its partners (Hagel & Brown, 2008). These platforms were and are still used to manage partners, to provide certifications and supporting services to complementary solutions and services offerings for developers, and to set up a structured partner program (Iansiti & Lakhani, 2009). All of this highlights SAP's tendency to look for better solutions to certain challenges and to learn from its partners or customers. With different types of portals/tools/platforms, SAP is able to be efficient in terms of knowledge transfer, absorbing knowledge, analysing problems and providing solutions to partners. Similarly, Autodesk uses its platform to analyse for ways to improve its technology, by sharing and exchanging knowledge with its partners. The case evidence suggests that Autodesk has put in place ways to analyze and learn systematically from its partners or customers.

As for its external resources (partnerships), CA has provided a partner portal, with an emphasis on addressing the needs of its customers or partners, rather than facilitating learning among partners or between a firm's partners and CA. This portal is provided by CA, so its customers have a one-stop resource for all their needs. This suggests that the partner portal focuses more on addressing customer needs through technology support and after-sales support, rather than CA's needs to use its external resources. In addition, although there are tools available for

Table 4.13. Cross-case analysis on firm's strategic actions in protecting the VRIN conditions of a firm resources

No	Dimensions	High performance		Low performance		Observed Differences between high and low performance
		SAP	AUTODESK	OPEN TEXT	CA	
1.	efficiency	creation of efficient internal structures, for instance after acquiring other firms	workforce reduction	restructuring following acquisitions	varied efficiency efforts, recovering from bad conduct	YES
		provide a platform have redundant and long-lasting relationships with some companies	availability of platform connecting partners and consumers to support sharing and exchanging knowledge	provide a platform have redundant and long-lasting relationships with some companies	availability of platform connecting partners and consumers to provide partners and customers' needs	
2.	dependency	acquisitions for core complementary resources	acquisition is a preferred mode to acquire core competences	acquisitions for core complementary resources	acquisition is a preferred mode to acquire core competences and indication to boost growth	YES
		have clear and detailed policies on partnerships	have focus groups and categories of partners			
		open architecture design with efforts to ensure its products' integrations over different platforms	open architecture design with efforts to advance its openness	products revolve around the Windows platform	open and flexible solutions but no further efforts for integration are identified	
3.	risk	legal IP protection and actively influence the standard	legal IP protection and natural barrier arising from technology nature and customer loyalty	legal IP protection	legal IP protection	YES
4.	constant rivalry	exercised aggressive posture	willing to sacrifice profit for market access	no price mechanism or other aggressive actions	no price mechanism or other aggressive actions	YES

managing Open Text's partnerships, they are mainly aimed at ensuring the availability of resources and solutions to its partners and customers, and less at managing knowledge transfer among its partners and making the best use of this knowledge. This shows that there are differences when it comes to managing the network of partners. Although there are no differences in terms of the internal efficiency-related efforts, there are differences when it comes to the strategic actions with regard to partnerships management.

Partners are an important part of the strategies of all four firms, which means that managing the dependency as a result of those partnerships may be an important factor explaining variance in firm performance. All four firms use partnerships to collaborate on non-core complementary resources and acquisitions for core complementary resources. Having collaborated with partners, firms provide governance mechanisms that are also necessary to manage dependency. We observed differences with regard to the availability of policies or criteria to govern the partnerships. Firms that performed well provided mechanisms to govern their partnerships. SAP did indeed have very detailed policies on partnerships. While no clear policies were found for Autodesk, it would appear that Autodesk started the partnerships by looking for individuals/researchers that added to its own focus of research. The Autodesk Research initiative has specific areas of research that become selection criteria in themselves for its partners.

As shown in **Table 4.13,** all firms can be categorized as being open and flexible, except for Open Text, which was dependent on one stable platform, i.e., Microsoft. Although all firms (except Open Text) used an open architecture, there appear to have been differences in the motivation and effectiveness in the way firms that performed well deal with it. SAP ensures that its solutions are developer-friendly and can be integrated into other vendors' database applications, operating systems, and hardware. Ensuring the continued functionality and compatibility of its product offerings, SAP worked with multiple partners, and participates in industry-wide initiatives to set the standards of new technologies. The other firm that performed well, Autodesk, showed efforts to advance its openness through the Open Source community. Autodesk initiated projects in the open source community and donated its technological assets, which allow customers to take advantage of the open source Feature Data Object (FDO) Provider for Microsoft SQL Server 2008. The two firms that performed less well displayed the opposite behaviour. Open Text's offerings revolve around the Windows platform, while CA showed no further initiatives to manage dependency, other than ensuring the compatibility of its products with various platforms. These differences in the way dependency was being managed may explain differences in profitability.

Dealing with dependency with regard to their partners, firms that are able to strategically provide tools that reduce the complexity associated with being dependent on others will perform better (Ireland et al., 2002). SAP has detailed policies that govern the relationships between SAP and its different categories of partners. Moreover, SAP has different policies and evolving criteria for each type of partners, ranging from partner selection, expectations, benefits and degree of commitment. Although Autodesk has less detailed policies and criteria, the way Autodesk organized its partner groups reflects the company's concerns in governing the relationships with its partners. Our analysis indicates the motivation of SAP and Autodesk to make their expectations toward their partners clear, to evaluate degrees of similarity, in terms of partnership interests, and to specify the potential and risk in partnerships which are important in realizing the benefits and integrating them efficiently and effectively (Ireland et al., 2002). Clear policies on partnerships increase trust, which is an important mechanism to protect firms from the opportunistic behaviour by partners or from conflicts with partners that potentially reduce the VRIN conditions of their resources (Das & Teng, 2001; Inkpen & Beamish, 1997).

Partnerships entail the risk of imitation, which may render a firm's competitive advantage obsolete. All firms rely on legal mechanisms to protect their IP, but firms that perform well acknowledge that IP sharing also stimulates cooperation and may therefore increase their competitive advantage. Consequently, firms that perform well partly rely on other mechanisms to protect their IP. Autodesk relied on the natural barriers resulting from its technological knowledge and on customer loyalty. SAP used technical measures, standardized and consistent quality of products, and implemented a risk management strategy that provides a holistic approach to risk analysis and mitigation.

Opportunistic behaviour, in terms of information leaks or imitation of a firm's products or technologies by competitors, needs to be prevented and mitigated, either by increasing trust through the use of detailed policies or by applying risk management, in terms of increasing flexibility and providing legal mechanisms (i.e., patents and copyrights). As discussed above, all four case firms acknowledge the importance of open architecture. They emphasize that their product offerings create open and flexible solutions, which increases their resilience in coping with opportunistic behaviour (Iansiti & Levien, 2004). In general, all firms use legal protection mechanisms to deal with the risk of imitation. However, the strategic actions of the firms that perform well are more diverse. Firms that perform well place a greater emphasis on protection, using technical measures or natural barriers in their product. SAP has an integrated risk management strategy, dedicates copyright agents to deal with complaints, and is actively involved in the setting of industry standards for service-oriented architectures (SOA) and business

process management. Thus, we conclude that differences in strategic actions designed to manage risks may influence the relationship between a firm's resources and performance.

Constant and intense rivalries among competitors may reduce a firm's competitive advantage. We observed differences in the way the forms responded to this threat. The firms that performed well adopted the necessary aggressive posture in terms of their willingness to sacrifice profit to acquire new customers. SAP used an incentive switch program for PeopleSoft customers following PeopleSoft's acquisition by Oracle, and it also acquired TommorowNow, which provides support to PeopleSoft, JDE and Siebel. Autodesk also engaged in price-cutting activities through appropriately priced products for certain consumers, and specially priced software purchasing offers, which positively impacted its sales. SAP and Autodesk appear to be able to use price mechanisms to attract more customers, showing their willingness to reduce short-term profits to create long-term growth. SAP also aggressively acquired a firm in response to aggressive actions by its competitors (e.g., Oracle) to secure and increase its customer-base.

4.5. Discussion

We presented a cross-case analysis of the four cases, which may further explain the results we found in Chapter 3. In Chapter 3, we found that a firm's internal resources have a negative effect on its performance. Based on this finding alone, one possible solution would be to reduce internal resources. However, this may be unrealistic, given that firms need those resources to perform and grow. The next question would be how we can explain these findings. Based on our theoretical discussions in Chapters 1 and 2, we would argue that strategic actions may play a role in the relationship between firm resource and performance. Thus, we conducted within and cross-case analyses involving firms with different levels of performance, by focusing on firm performance over time, firm attributes, resource configurations over time, and strategic actions, as shown in **Table 4.14**. We begin by discussing strategic actions and other firm-specific factors.

4.5.1. Strategic actions

From the cross-case analysis, we can observe differences and similarities between the two contrasting groups of firms (SAP and Autodesk versus CA and Open Text). There are differences in their strategic actions, as shown in **Table 4.14**, necessary to enhance and protect the VRIN conditions of their resources. Differences were observed in terms of product leadership, vision, efficiency management, dependency management, risk management and the response to constant rivalry.

The first notable difference involves strategic actions related to product leadership. When competing and collaborating with other firms, a firm needs to enhance the VRIN conditions of its resources. Differences are observed in the way firms used their technological assets and in the way they set and share their vision. With similar technological assets, firms that performed well took proactive actions in searching and developing cutting-edge technology in cooperation with their partners. As stated by their CEO's in their letters to stockholders, being innovative and exploring cutting-edge technologies was seen as an important cause of firm performance. These actions reflect explorations of new innovations or technologies that support a firm's current competitive advantage, through structuring and reconfiguring its current resources, as well as by developing new knowledge (Katila & Ahuja, 2002; Teece, 2007). Being engaged in searching and developing cutting-edge technology opens up new business opportunities, and influences the development processes that may shape new technology trajectories (Gawer & Cusumano, 2002; Schilling, 1998).

Table 4.14. Characteristics that differentiate better performing firms in each category

No.	Dimensions	Higher Profitability
1.	firm performance over time	stability in trends over time
2.	firm attributes	
	• founded (age)	no difference
	• employee	no difference
	• revenue streams	no difference
	• product portfolio	differentiation in a focused market segment
3.	firm's resource configuration over time	stability in trends over time in their techological assets
4.	**firm's strategic actions: Enhancing the VRIN conditions**	
	• product leadership	proactively participating in cutting-edge technology with partners
	• market leadership	no difference
	• vision	proactively influencing the vision of future in its market segment by using short-term and long-term plan
	firm's strategic actions: Protecting the VRIN conditions	
	• efficiency focus	availability of a platform to learn from each other
	• managing dependency	clear and detailed policies on managing partnerships proactively ensuring integration and openness among their partners
	• managing risk	use both legal IP protection and other measures that enable openness, flexibility and interoperability
	• constant and intense rivalry	exerted aggressive actions in response to aggressive actions by its competitors

The second notable difference is related to vision. A firm's vision makes the firm responsive to threats and opportunities in its external environment (Miles & Snow, 1978, Treacy & Wiersema, 1995). Firms that perform well seem to take the lead in setting distinctive visions by having short-term and long-term plans, and by sharing those plans with their partners. Having a shared vision will proactively push a firm's partners, which come from different product segments, to create new business opportunities to complement its product offerings or to respond in a coordinated way to potential threats (Lavie, 2007). This is also supported by empirical evidence (Courtney, Kirkland, & Vigueri, 1997; Morgan & Strong, 2003), which indicates that companies that engage in proactive actions with regard to technological leadership and vision perform better.

The third difference related to strategic actions is efficiency management. While there is no difference when it comes to internal efficiency, there is a difference with regard to partnership management. The firms that perform well would appear to use strategic actions, providing a platform that connects partners and systematically learn and share their knowledge with their partners and customers. This kind of partnership platform enables efficient knowledge transfer (Ireland et al., 2002) and knowledge mobility (Dhanaraj & Parkhe, 2006) among partners, which increases a firm's learning, which in turn has a positive effects on firm performance (March, 1991). However, this result should be carefully interpreted, since internal management or routines are difficult to observe from the outside, while external management or routines are easier to observe, since they are shared with parties.

The fourth notable difference involves strategic actions in relation to dependency management. Being connected to partners, firms face the possibility of being dependent on others, which may influence the relationship between their resources and performance. Existing resources may have a negative effect on firm performance, since firms may be trapped in current competencies (Leonard-Barton, 1992; Levitt & March, 1988). To avoid this trap, strategic actions aimed at creating an open product architecture are important. Open architectures accommodate different technology trajectories. A firm's alignment with more than one platform or technology trajectory increases the likelihood of better interoperability and added complementarity (Iansiti & Levien, 2004). We expect interoperability and greater complementarity will enrich a firm's product offerings and reduce its dependency on partners (Iansiti & Levien, 2004; Lavie, 2007). It will increase their flexibility and reduce the risk of a lock-in in terms of product development. While all firms positioned themselves as open and flexible (except Open Text), there are differences in the actions designed to ensure flexibility and dependency. The two firms that performed well advanced openness either by nurturing an open source community or working with multiple partners in setting

standards. Moreover, they had policies or governing mechanisms that reduced complexity and increased mutual understanding in partnerships. These policies clarify the expectations of a form and its partners, as well as the benefits and degree of commitments, which is conducive to reducing the complexities of partnerships, increasing trust and developing mutual understanding. To summarize, being compatible with different platforms, ensuring integration with complementary product offerings and increasing mutual understanding, reduces dependency and, as such, increases the flexibility needed to protect a firm's competitive advantage from becoming obsolete (Schilling, 2002; Tanriverdi & Lee, 2008).

The fifth notable difference involves strategic actions aimed at risk management. The firms that performed well used a greater diversity in terms of their strategic actions designed to deal with risk and to protect their IP, while maintaining a degree of openness to enable flexibility and interoperability, which are important to efficient and effective partnerships (Iansiti & Levien, 2004; Schilling & Steensma, 2001).

The final notable difference involves the strategic actions designed to respond to constant and intense rivalries. The two firms that performed well engaged in the kind of aggressive strategic actions needed to protect the VRIN conditions of a firm's resources, to ensure the positive relationship between its resources and performance. The software industry is very competitive, with low entry barriers, making it easy for new firms to market innovative products. Aggressive actions allow firms to protect the VRIN conditions of their resources and use the efficiency benefits of their existing resources, which, in turn, allow them to edge out their rivals (Makadok, 2011). Firms doing otherwise may have to share their market with competitors.

Although there are also similarities in the firms' strategic actions, we were unable to link them to performance levels. Unlike what we expected, all four firms showed a combination of these traits. For example, all firms stated that their existing product lines, channels or partners were their competitive advantage, allowing them to take strategic action to improve their performance. All firms use their internal and external resources strategically to achieve market leadership. Also, while assessing how firms manage dependency, we initially looked for an emphasis on complete integration versus complete collaboration. All firms in a way showed a mix of complete integration and collaboration. They managed to combine collaboration on non-core complementary resources through partnerships with a complete integration of core complementary resources through acquisitions. Acquisitions are preferred by firms that focus on complete integration, reducing their dependency on others, in particular in terms of core

complementary resources. These acquisitions were intended to extend the scope their portfolios rather than to create have complete integration across the value chain. This may indicate that they would like to increase efficiency, while at the same time eliminating the risk of leaking the value of their core resources.

We propose that *a firm showing a diverse range of strategic actions, i.e., fulfilling the two roles of a firm's strategic actions (enhancing and protecting the VRIN conditions of its resources) will perform better.* Supporting our proposition, strategic actions designed to manage a firm's relationships with its partners seem to have a positive effect on firm performance. SAP and Autodesk took various actions to improve efficiency, manage risks and manage their dependency on their numerous partners, which allowed them to capitalize on their resources and on their partners' resources. With profitability as an indicator of firm performance, we observe that SAP and Autodesk took a wider range of strategic actions, which positively influenced the relationship between their resources and profitability. Having product leadership and being proactive and visionary enables firms to move ahead of their competitors. Hence, firms enjoy the benefit of early commitment to technology trajectories, thereby capturing the first adopters, which are loyal customers creating brand loyalty (Lieberman and Montgomery, 1988), making it possible to create and exploit switching costs (Lieberman & Montgomery, 1988). This in turn has a positive impact on the firm's competitive advantage and on its profitability. SAP and Autodesk also engaged in defensive and analytical strategic actions that enabled them to maintain or improve their efficiency, thus protecting the VRIN condition of their resources. In dealing with the threats in their competitive environment, SAP and Autodesk could take more aggressive actions, but were also able to maintain their interdependency with regard to both their competitors and their collaborators. They were also able to take various actions that reduced potential risks, since they understood the risks of opportunistic behaviours and the constant rivalry the faced from their competitors.

4.5.2. Other firm-specific factors

We controlled our observation by observing firm-specific characteristics: firm performance over time, firm attributes and resource configurations over time. We observed that a firm's portfolio, stability in terms of firm performance and stability in terms of resource configuration matters. The four companies operated in the same industry and experienced the same industrial events (economic crises, industrial contraction, fierce competition) as a result of low entry barriers and network effects, which caused market concentration. Given this condition, we could conclude that firms are bounded by their past. Stability in the accumulation of resources and past performance seem to play a role in a firm's current

performance. CA's performance was claimed to be influenced by the wrong-doing on the part of its management, which happened in the fiscal years 2000-2003. As shown in **Table 4.14**., stability in a firm's previous performance is a distinguishing factor between the contrasting firms. Stability in performance allows firms to devise various strategies that are beneficial both in the short and the long term. Since there is a systematic relationship between strategic adaptability and firm performance (McKee, Varadajan, & Price, 1989), stability in performance is an indication of a firm's success in strategically adapting to changes in its external environment over time. Moreover, it also reflects a firm's success in flexibly creating and implementing diverse strategic actions (Steffens et al., 2009). Firms with a fluctuating or decreasing performance over time have limited flexibility in implementing strategy to pursue emerging business opportunities and are often forced to focus on existing conditions to avoid bad performance or even bankruptcy.

Firms that perform well also show a positive or stable build-up of resources, which is an indication that history matters (Madhavan et.al 2008). This may also indicate the importance of strategic actions. Volatile or negative trends may push firms to focus on exploiting their existing resources rather than enhancing or reconfiguring their resources. Stable and positive trends in terms of resources may indicate a firm's flexibility in developing or reconfiguring its resources in response to emerging opportunities and treads in its external environment. The positive influence of this stability on firm performance may indicate a good fit between the firm's strategic actions in the past and its current resources, allowing it to respond to emerging threats and opportunities in its external environment.

There are also differences in terms of the scope of product portfolios, which appears to be the result of the firms' past strategic actions by creating multiple products to exploit their resources, increase their efficiency and manage the risks associated with competition or the failure of certain products (Farjoun, 1994; Robins & Wiersema, 1995). All firms, with the exception of CA, focus on one of market segment (i.e., SAP and Open Text in enterprise solutions, Autodesk in the mass-market software products) (Hoch et al., 2000). SAP had differentiated products that were based on different delivery models and industrial applications, while Autodesk had differentiated products that were based on industrial applications. This differentiation within a focused market segment makes it possible to use common resources across multiple products within a single product segment, thereby creating economies of scope (Davis & Thomas, 1993). As clarified by Venkatraman et al. (2008), firms like SAP and Autodesk create variations in the delivery model and industry applications to be able to re-use their software codes, which reduces new product development times and increases rapid access to new product segments (Venkatraman et al., 2008).

These actions may indicate a focus on extended product offerings by strategically creating partnerships with firms in different domains. Thus, these firms gain a competitive advantage by having rapid access to new product segments and being able to use their resources efficiently.

4.6. Concluding Remarks

4.6.1. Conclusions

A firm's valuable, rare, inimitable and non-substitutable (VRIN) resources inherently give it a competitive advantage, the expectation being that this will have a positive impact on their performance. Because the external environment keeps changing, the relationship between a firm's resources and performance is not straightforward, which is confirmed by our own and others' empirical findings. This relationship is influenced by threats and opportunities within the firm's external environment. We propose that a firm's strategic actions are instruments that can be used to actively respond to and manage these threats and opportunities. Based on our empirical findings in Chapter 3, we conducted four case studies to understand the role of strategic actions in the relationship between a firm's internal and external resources, and its performance.

The within-case and cross-case analyses indicate that strategic actions do play an important role in the relationship between a firm's resources and its performance. We were able to identify differences between firms based on their level of performance. With similar resource configurations, firms engage in a variety of strategic actions and emphasize different emphasis dimensions in their strategic actions, in terms of product leadership, vision, efficiency, dependency management, risk management, responses to constant rivalry, orientation with regard to partnerships and the use of external resources. These observations indicate that strategic actions are importants factor influencing the relationship between a firm's resources and performance (see also Madhavan et.al 2008; Koka & Prescott, 2008; Venkatraman et al., 2008). On the other hand, since we also included product portfolios, stability in performance over time and stability in resource configurations over time, we must be careful in drawing rash conclusions with regard to the influence of strategic actions of firms.

There are three main observations in this Chapter. First, history matters, as shown by the differences in the stability of the trends of the firms' past performance and their internal resources, as well as in the scope of their product portfolios. Stability over time may indicate a continuous build-up of resources, as a result of a firm's strategic actions over time. The positive influence on performance indicates a good fit between a firm's strategic actions in the past and its current resource

configuration to respond to emerging opportunities and threats in its external environments.

Second, strategic actions matter, as shown by the differences in strategic actions across certain dimensions between firms with different performance levels. With similar resource configurations, firms engage a variety of strategic actions on several dimensions. Firms that perform well show similarity in their actions designed to enhance and protect the VRIN conditions of their resources. They utilized both their internal and external resources to respond to threats in their competitive and collaborative environments. We observe that all firms show a different variety of strategic actions or the same actions, but put an emphasis on different dimensions of these actions. Variance in firm performance is likely to be influenced by the emphasis a firm uses in its strategic actions, which reflects the firm's orientation of alignment between its resources and its external environment.

Third, we see that a firm's orientation towards its network matters. Firms that perform well capitalize on their internal and external resources. They complement their internal resources with external resources. They strategically act on opportunities and threats from their competitive and collaborative environments. They co-innovate and share their visions with partners in their network, and proactively provide policies and platforms to cooperate and facilitate learning.

These main observations suggest that the relationship between a firm's resources and performance is not straightforward, as also indicated by, among others, Barney and Arikan (2001), Sirmon et al. (2007) and Ray et al. (2004). This chapter confirms that a firm's strategic actions influence the relationship between its resources and performance. The strategic actions are likely to provide them with mechanisms that enhance and protect the VRIN conditions as a source of competitive advantage that is inherent in the resources from emerging threats and opportunities in the external environment. In this way, firms actively respond to and manage emerging threats and opportunities in their external environment, making their resources competitive and improving their performance.

4.6.2. Limitations and further research

There are three implications for further research. The first is the need to investigate the fit between a firm's resources and strategic actions. Further research needs to involve larger empirical samples that enable generalization of these findings. The second implication is the need to examine our findings in a longitudinal setting. Since we observed that history matters, further research in a longitudinal setting is important. The third implication is the need to design an appropriate tool to measure strategic actions, which should capture a firm's

strategic actions, including the nuanced differences and tensions inherent in the firm's internal and external resources, as well as in the characteristics of its competitive and collaborative environments. Some features that are related to a firm's internal efforts are difficult to observe, for example the effect of a firm's strategic actions (efficiency focus) on its routines. Most importantly, although we can infer the subtle differences in a firm's strategic motivation, we could not argue that motivation is what sets firms with different performance levels apart. Measuring the perceptions of the firms' executives can capture strategic motivation. Unfortunately, we were unable to obtain these perceptions, which limit our ability to draw conclusions regarding the influence of the firms' strategic actions. In addition, because the strategic actions in collaborative and competitive environments affect firm performance, a measurement tool should acknowledge both competitive and collaborative environments and the tension that exists between them. Such a tool should also reflect the relative emphasis on a range of dimensions, as described above, to be helpful in capturing the two important roles of a firm's strategic actions: enhancing and protecting the VRIN conditions of its resources.

After the within-case analysis, we did a cross-case analysis of the four firms. While it is considered sufficient to search for the patterns, one case experienced a negative event in the past that still affected its performance during the analysis period, which altered its strategic orientation, and complicated our analysis. In addition, the dimensions of strategic actions, which were based on a literature review, may not be sufficient to explain every type of strategic action. However, we believe that, at a conceptual level, these four different firms provided us with insight into the most prominent strategic actions. It would be interesting to cover more sectors and various types of firms, to get an even clearer view of the various types of strategic actions at a conceptual level. This avenue for further research would be interesting to increase understanding of the concept of strategic actions.

Using a case study analysis enabled us to understand the background and subtle differences in a firm's motivation to engage in certain strategic actions. Secondary data analysis may provide a more objective valuation of the actions involved. From the case study results, there is an indication of bias due to omitted variables. Nevertheless, there may be characteristics of the specific sub-segment of the industry in which a firm is active that influence the results. These kinds of omitted variables do not diminish the value of our conclusion that a firm's strategic actions in the network matter, but for a larger-scale statistical study, they need to be taken into account. Of course, for any cross-sectional research, industry factors would need to be taken into account as well.

5. Strategic Orientation: Strategy in a Business Network

In **Chapter 4**, based on case studies involving four firms, we found that strategic actions play an important role in the relationship between a firm's resources and its performance in a business network (Koka & Prescott, 2008; Madhavan et al., 2008; Venkatraman et al., 2008). To better understand the generic influence of strategic actions on this relationship, it is important to prepare an appropriate instrument to measure and capture a firm's strategic actions in a business network. The development of such an instrument has received relatively limited attention in strategic management literature (Boyd, Bergh, Ireland, & Ketchen, 2011), which is why, in this chapter, we asked this question: (Q4) *How can firm strategic actions in a business network be measured*?

5.1. Firm strategy in a business network

In **Chapter 4**, we suggested that a firm's strategic actions play two roles in influencing the relationship between a firm's resources and its performance in a business network: enhancing and protecting the VRIN conditions of the firm's resources. We found that performance is related to the diversity of a firm's strategic actions. All firms realized technological leadership by using their internal technological resources and by acquiring resources that are complementary to their core competences. In addition, they use partnerships (for instance with complementary partners or suppliers) to increase interoperability and enrich their product offerings. We observed similar strategic actions for all four case firms, in which they use their marketing assets and partnerships to access new markets and extend their customer base. The firms we investigated showed similar initiatives and involvement in events that bring their respective networks and markets together. As for protecting their VRIN conditions, the firms focused on efficiency through internal consolidation, such as restructuring after acquisitions or cost cutting activities.

Next to similarities, there are also some notable differences between firms with different levels of performance (see **Chapter 4**). To enhance their VRIN conditions, firms that performed better proactively got involved in co-innovation initiatives and cutting-edge technology development, and set visions, accompanied by short-term and long-term plans, which they shared with their communities (i.e., consumers/customers and partners). Moreover, firms that performed better provided tools to facilitate learning and the exchange of resources among partners and customers, creating a win-win situation. They provided clear policies that helped them manage dependencies between themselves and their partners,

emphasizing the openness of their product architecture, while also providing a combined protection of their VRIN conditions. In addition, they were able to engage in aggressive strategic actions to protect the VRIN conditions of their resources against constant rivalries in their external environment.

Given these facts, any attempt to measure the firm strategy construct in a comprehensive way requires measuring not only the way a firm uses its internal and external resources, but also the way its firm responds to its competitive and collaborative environments (Clarke-Hill et al., 2003).

5.2. Approach to develop a construct of strategy

5.2.1. Available approaches

There are three approaches that can be used to develop an instrument to measure the strategy construct: the narrative, the classificatory and the comparative approach (Venkatraman, 1989). The narrative approach is a case-based approach, in which a narrative about complex characterization of strategy is *described* in its holistic and contextual form (Venkatraman, 1989). It is rarely used, but, due to the philosophical abstraction of the strategy concept, this approach is suitable for conceptual development (Venkatraman, 1989). Consequently, its use for testing theories is limited.

The classificatory approach focuses on the categorization of firms in one cell of classifications and uses either conceptual or empirical strategy classifications (Venkatraman, 1989). Several widely accepted classifications are the prospector, analyzer, defender and reactor classification (Miles & Snow, 1978); the generic strategies of cost efficiency, differentiation and focus (Porter, 1980); operational excellence, product leadership and customer intimacy strategies (Treacy & Wiersema, 1993); exploitation and exploration strategies (March, 1991); and first mover and follower strategies (Lieberman & Montgomery, 1988).

A third prominent approach to develop a strategy construct is the comparative approach, which decomposes the variation in strategies into more finely-grained differences along strategy dimensions (Venkatraman, 1989), which reflect distinct patterns that result from a firm's consistency in adopting strategic actions to respond to changes in its external environment. A firm's overall strategy is considered in terms of the relative emphasis a firm puts on each strategic trait (Morgan & Strong, 2003).

5.2.2. Selection of approach

In selecting an approach to develop an instrument to measure the strategy construct, we look at previous research and our empirical findings in Chapter 4.

Previous studies on the interaction effect of strategy with the network position and/or other resources uses proxies to measure strategy in terms of competitive actions (Gnywali et al., 2006), product scope and market scope (Venkatraman et al., 2008), or analyzer and defender strategy (Koka & Prescott, 2008). While these proxies provide advantages for empirical tests with respect to data availability, there are limitations in reflecting the broader concept of strategic actions in a business network adequately and accurately. Despite its popularity and attractiveness, this approach can possibly exclude important strategic dimensions or fail to detect subtle nuances in the dimensions that make up a firm's strategy (Morgan & Strong, 2003). These empirical difficulties arise because firms put different emphases on the dimensions of their strategy, which means that strategies do not fall exactly into a certain classification (Desarbo, Di Benedetto, Song, & Sinha, 2005; Moore, 2005). Firms make trade-offs between the various dimensions of their strategy, which can only be captured by observing the relative emphasis that firms put on the different dimensions.

In **Chapter 4**, we observed that firms that perform well engage in various strategic actions across different dimensions in response to their competitive and collaborative environments. Because firms engage in a range of strategic actions, it is difficult to categorize them into certain strategy classification. Firms may engage in similar strategic actions but put different emphases on different dimensions. In this sense, the comparative approach is more appropriate than the classificatory approach, because it allows us to measure strategy with an emphasis on each dimension and capture the trade-offs between the different dimensions.

5.3. Measuring strategy construct as a strategic orientation

5.3.1. Strategic orientation

The concept of a firm's strategic actions can be captured using a construct of strategic orientation. A firm's strategic orientation refers to the outcome of strategic decisions in finding a favourable alignment between a firm's resources and its external environment (Manu & Sriram, 1996; Morgan & Strong, 2003). It refers to firms' key strategy dimensions, i.e., patterns of a firm's strategic actions (Venkatraman, 1989). In this sense, the firm's strategic orientation construct allows us to observe variance in strategic actions along key strategic dimensions (Gupta & Somers, 1996). We therefore continue the research stream of measuring a firm's strategic actions using a strategic orientation construct to systematically capture variance along key strategic dimensions.

We adhere to the strategic orientation construct, in which strategy is viewed as a pattern of decisions (Mintzberg, 1978) that manifest themselves in the actions of a firm (Mintzberg & Waters, 1982). This allows us to identify and measure

dimensions, and evaluate the emphasis a firm puts on each dimension to improve or maintain its performance. This requires the use of multi-dimensional scales representing the key dimensions of the firm's strategy. In a strongly connected external environment, a firm's orientation includes key strategic dimensions with respect to the competitive and collaborative environment.

5.3.2. Current measurements of strategic orientation

Currently, there is a limited number of conceptualizations of strategic orientation using the comparative approach (Morgan & Strong, 2003). Some examples are the strategic orientation of business enterprise (STROBE) by Venkatraman (1989), and strategic orientation by Gupta (2006), market orientation by (Narver & Slater, 1990) and entrepreneurial orientation by Lumpkin and Dess (1996). Only STROBE by Venkatraman (Venkatraman, 1989) and strategic orientation by Gupta (2006) encompass the strategy of a firm from a broad perspective that covers more than one specific functional strategy. Venkatraman's strategic orientation encompasses key strategic dimensions that are needed to realize a competitive advantage. While the existing STROBE taps into important dimensions of the firm's strategic orientation, it may not be comprehensive enough, since it does not explicitly capture how a firm makes use of resources available in its network and responds to the threats/opportunities in its collaborative environment.

An attempt to include a network aspect into strategic orientation has been made by Gupta (2006), who introduces strategic orientation, including leadership orientation, relationship orientation, and learning orientation, in a polar construct for each dimension: cooperative and competitive for its relationships orientation, entrepreneurial and managerial for its leadership orientation, adaptive and generative for its learning orientation. Gupta (2006) operationalized these dimensions with multi-item scales, some of which were drawn from items used in literature, while others were generated on the basis of theoretical arguments. The polar operationalization that Gupta (2006) used to operationalize the relationship dimension is drawn from currently available measures in mainstream marketing and supply chain literature. Gupta (2006) approached relationship (alliance) orientation by subsuming customer orientation (Gatignon & Xuereb, 1997) and market orientation (Kohli & Jaworski, 1990), and generated additional items based on theoretical arguments, which in turn are based on alliance management literature (Johnson, Cullen, Sakano, & Takenouchi, 1996; Kale et al., 2000; Sarkar, Echambadi, & Harrison, 2001; Sivadas & Dwyer, 2000; Zeng & Hennart, 2002) or seller-buyer relationships literature (Johnson, 1999; Skarmeas, Katsikeas, & Schlegelmilch, 2002).

5.3.3. Requirements for a measurement instrument

Based on the results of the previous chapter and on strategic management literature (Kale et al., 2000; Zaheer, Gözübüyük, & Milanov, 2010), we argue that, to fully incorporate possible strategic tensions in competitive and collaborative environments, a strategic orientation measurement should transcend that of a firm's supply chain or single alliance relationships, and include a firm's business network. Being engaged in a network, firms are required to take concerted actions simultaneously to compete and collaborate with other firms, that go beyond individual alliance relationships or seller-buyer relationships. A firm's business network is composed of partners who are connected to their own set of partners, which may also be partners or competitors of the firm in question (Gulati, 2007). Strategic moves from competitors that are connected to a firm's partners may have a positive or negative influence on a firm's performance. In addition, the partners of a firm's partners (i.e., a firm's indirect partners) provide information-related benefits for the firm (Iyer et al., 2006). While direct partners are sources of complementary resources, indirect partners are primarily sources of information that may lead to new opportunities (Ahuja, 2000). These indirect partners can also bring risks and uncertainties that may endanger a firm's competitive advantage. Since the firm is connected to others, whatever happens in one part of the network could resonate throughout the network and may influence the firm's performance. These reasoning are important to resources as sources of competitive advantages needs to be strategically managed to positively influence a firm's performance (Koka & Prescott, 2008; Venkatraman et al., 2008). Therefore, a firm's strategic orientation should contain its orientation toward partnerships, both direct interactions with partners (i.e., direct partnerships) and interactions with partners' partners (i.e., indirect partnerships).

Gupta (2006) tried to capture a firm's actions in relationship orientation, but only focused on current relationships, leaving out orientation in developing and shaping new relationships. Iyer et al. (2006) pointed out the importance of this and developed a framework to assess a firm's business network so that a firm could devise a network-related strategy for improving its performance. A firm's network is the result of a continuous development of relationships (in the form of strategic alliances, joint ventures or supply agreements) with other firms, which means that a firm can shape and maintain its network by creating new agreements, abandoning current agreements or creating a platform that enhances cooperative agreements among its partners.

To this end, the measurement of a firm's strategic orientation should explicitly include its strategic actions in response to the opportunities and/or threats within its collaborative environment and the way it positions itself in a network by

maintaining current relationships, developing and shaping new relationships, capturing the value-enhancing resources, and mitigating the threats emerging from its network. The measurement of strategic actions in response to the firm's collaborative environment should be done in alignment with existing research, which found that a firm's network-related actions are important to its competitive advantage (Ireland et al., 2002). The measurement also needs to reflect and allow us to assess the relative emphasis in the firm's responses toward the various stakeholders (Gupta, 2006).

5.4. Proposed extension to the existing STROBE scale

One of the well-developed and frequently used strategy constructs using the comparative approach is Venkatraman's strategic orientation of business enterprise (STROBE). It is comprehensive and includes dimensions reflecting distinct patterns of strategic actions adopted by firms in response to their competitive environment. We use Venkatraman's (1989) STROBE instrument as a basis for extension, because it was repeatedly tested, validated and refined by several researchers. Morgan and Strong (2003) and Byrd, et al. (2006) refined Venkatraman's STROBE by using it in different samples. The refinement resulted in rewording of items and deletion of items. Chan et al. (1997) refined STROBE by sorting and grouping the items in the initial STROBE of Venkatraman (1989). To our knowledge, no effort has been made to date to extend the existing STROBE with the network-related strategy.

While STROBE is a suitable tool to measure the range of a firm's strategic actions, it may be of limited use within the context of a business network. Since several researchers (Hakansson & Snehota, 2006; Kale et al., 2000; Riemer & Klein, 2006), and the outcomes of the case studies of **Chapter 4** indicate the importance of network-related strategic actions, STROBE needs to be reconsidered. We argue that, in order to increase the relevance and precision of STROBE, we need to include the business network context. We need to capture the key dimensions of a firm's strategic actions in deploying external resources and responding to threats/opportunities in the collaborative environment. Excluding this aspect biases the measurement of a firm's strategy in a business network toward the internal resources and their use in response to the competitive environment. This provides an important point of departure for an extension of a strategy measurement tool, to make it more consistent with the concept of strategy within a business network.

5.4.1. Venkatraman's six dimensions of strategic orientation

Venkatraman (1989) identified the six dimensions of strategic orientation *a priori* based on theories that guided the construct definition, and they reflect crucial

traits of a firm's strategic orientation. He developed and empirically tested the theoretical underpinnings of the construct of strategic orientation, which resulted in six distinct strategy dimensions: 1) *Futurity*, 2) *Pro-activeness,* 3) *Defensiveness*, 4) *Analysis*, 5) *Aggressiveness* and 6) *Riskiness* (see **Table 5.1**). The dimensions represent distinct patterns of strategic actions in finding an internal fit (internal arrangement) and an external fit (a firm's alignment with its external environment) (Venkatraman, 1989). Firms place different emphases on each of those dimensions, which cover: (1) future focus in terms of relative emphasis of effectiveness and efficiency, (2) continuous search for market opportunities and experimentation, (3) a focus on cost reduction and efficiency-seeking methods, (4) a problem-solving posture, (5) the pursuit of market share/position in the short run, and (6) a risk-taking posture in decision-making.

Table 5.1. The six dimensions of Venkatraman's STROBE

Dimensions	Definition as given by Venkatraman (1989)
Futurity	This dimension reflects temporal considerations embedded in key strategic decisions, in terms of relative emphasis of effectiveness considerations versus efficiency considerations.
Pro-activeness	This dimension reflects pro-active behaviour about participation in emerging industries, the continuous search for market opportunities and experimentation, with potential responses to changing environmental trends.
Defensiveness	This dimension captures the defensive behaviour of an organization through the extent to which the organization uses cost reduction and efficiency-seeking methods.
Analysis	This dimension refers to the tendency of an organization to search deeper for the roots of problems and to generate the best possible alternative solutions.
Aggressiveness	This dimension reflects the trait adopted by an organization in allocating its resources to improving its market position at a relatively faster rate than the competitors in its chosen market.
Riskiness	This dimension captures the extent of risks in various resource allocation decisions, as well as the choice of products and markets.

5.4.2. Connecting Venkatraman's six dimensions with dimensions of firm strategy within a business network

We developed dimensions of a firm's strategic actions within a business network in **Chapter 4**. We identified that vision, product leadership, market leadership, efficiency, dependence, constant and intense rivalries, and risks reflect a firm's strategic actions designed to enhance and protect the VRIN conditions of its resources. The STROBE by Venkatraman (1989) has six dimensions: *Futurity*, *Pro-activeness*, *Defensiveness*, *Analysis*, *Aggressiveness* and *Riskiness*. The relationship

between the two roles and seven dimensions of a firm's strategic actions in its external environment, and how they are captured by the six dimensions of Venkatraman's STROBE, is shown in **Figure 5.1.**

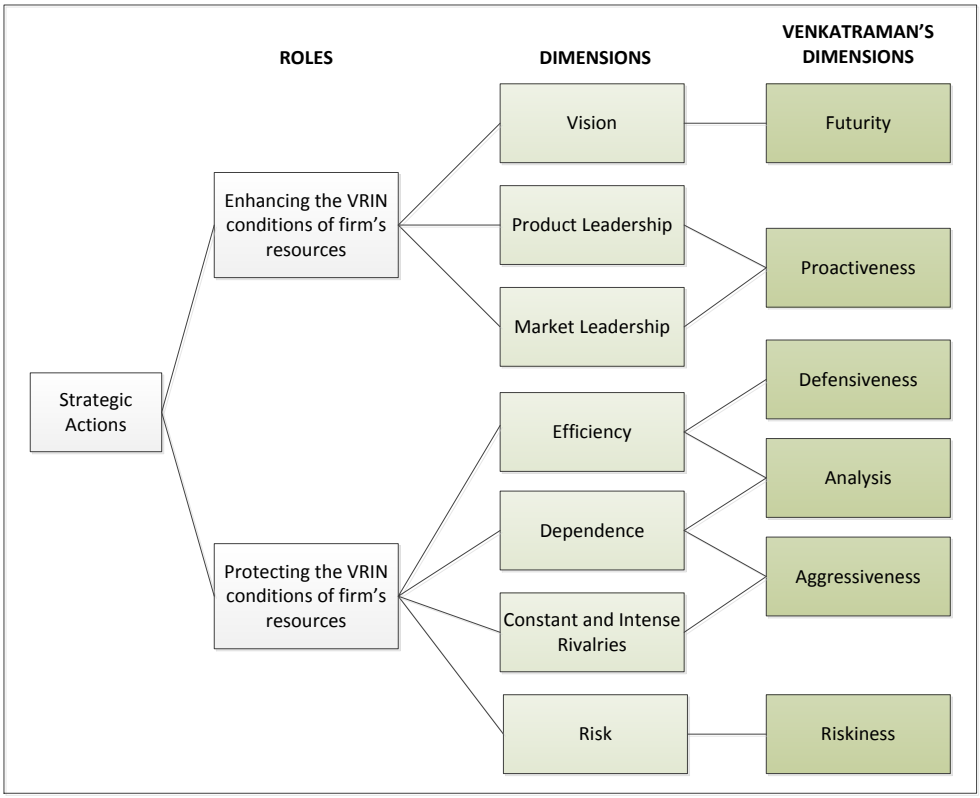

Figure 5.1. The relationship between the two roles and seven dimensions of a firm's strategic action in its competitive and collaborative environments and the six dimensions of STROBE

Enhancing the VRIN conditions requires a firm to respond in a timely manner to threats in its external environment and to avoid being locked into value-diminishing trajectories, which is reflected in *Futurity* dimension of STROBE. It requires vision to reduce corporate anxiety about the future and to provide a foothold for understanding the patterns and potential changes in both environments, i.e., the *Futurity* dimension. Enhancing the VRIN conditions also means that a firm has to compete proactively in markets and networks (Gupta, 2006), using its internal and external resources to shape/create opportunities. The *Pro-activeness* dimension reflects the product and market leadership dimensions to enhance the VRIN conditions. Those two dimensions are reflected by the two dimensions by being the best products in the market (i.e., product

leadership) and/or being the first in the market (i.e., market leadership). They reflect a firm's proactive actions to shape its external environment by creating the best fit between its organization and changes in its external environment.

Protecting the VRIN condition by using cost efficiency-related actions is reflected in the *Defensiveness* dimension of STROBE. Since firms evolve in response to the dynamics in their external environment, they need to engage in strategic actions to ensure an efficient use of their internal and external resources. In this way, firms can defend themselves through cost efficiency-related actions from emerging threats in their environments that might weaken their competitive advantage.

Managing dependency is another dimension that is important to protect the VRIN conditions of a firm's resources. Two dimensions of STROBE, i.e. *Analysis* and *Aggressiveness*, capture a firm's actions designed to manage dependency. Managing dependency, which is characterized by mutual understanding, and partnerships management that govern resource sharing and learning, are important aspects to support decision making and provide win-win solutions, as reflected by the *Analysis* dimension of STROBE. Managing dependency by exercising degree of control over the firm's partners to avoid excessive dependence is reflected by the *Aggressiveness* dimension.

Constant rivalry from a firm's competitors may reduce the VRIN conditions of its resources. Firms engage in strategic actions to deal with constant rivalries by using competitive actions, as reflected in the *Aggressiveness* dimension of STROBE. The risk dimension has to do with managing risk in firm's collaborative and competitive environments (Ireland et al., 2002). The *Riskiness* dimension captures a firm's proclivity to take risks in various resource allocation decisions and in choices regarding product or technology trajectories. Firms that embrace this risk dimension combine the entrepreneurial skills of constructive risk-taking with opportunistic opportunity-seeking (Baird & Thomas, 1990).

We conclude that the six dimensions of STROBE capture the orientation needed by a firm in an environment that requires simultaneous competition and cooperation. While we consider that the dimensions cover the range of a firm's key strategic traits, the operationalization has a tendency towards deployment of a firm's internal resources as reflected in the description of the dimensions, as follows:

> *" … the adjustment is made in areas such as organizational structures, manufacturing technologies, bargaining power over customers and suppliers" (*Venkatraman, 1985*)*

*"..the use of appropriate management systems (information systems, environmental scanning systems, managerial reward systems, competitive intelligent systems)" (*Venkatraman, 1985*)*

In addition the tendency towards internal resources is also reflected in the items reflecting *Defensiveness* dimension, such as:

"*significant modifications to manufacturing technology";*
"use of cost control systems for monitoring performance";
"use of production management techniques";
"emphasis on product quality through the use of quality circles" (Venkatraman, 1985)

5.4.3. Extension of Venkatraman's scale

Since a firm's collaborative environment has different characteristics from its competitive environment in terms of dependency, sharing and openness, it is necessary to add items representing a firm's key traits in response to its collaborative environment and in using its external resources. The STROBE items are reflective indicators, i.e., the sum of all items loads are a representation of each dimension (Viswanathan, 2005). As a firm's strategic actions are found to be important in explaining the variance of firm performance in business networks, we chose to increase the depth of Venkatraman's STROBE by adding items that explicitly represent a firm's use of its external resources and the way it responds to its collaborative environment. This means that the extended construct will maintain the dimensions as developed by Venkatraman (1989), but, for each dimension, we add items based on the literature discussion to explicitly include the firm's strategic actions that reflect the use of its external resources and its responses to its collaborative environment. By improving the domain breadth of STROBE (Matsuno & Mentzer, 2000), we expect to increase the precision of measuring a firm's strategic actions within a business network.

This adaptation leads to adjustments of the items that reflect the dimensions, but not of the dimensions themselves, as shown in **Figure 5.2**. It shows the initial model that we conceptualized for each dimension. We propose to add network-oriented items to the current dimensions of STROBE as developed by Venkatraman (1989) and refined and validated by Morgan and Strong (2003) and Byrd et al. (2006).

We use to the following principles to ensure that the adaptation is in line with the theoretical domain used by Venkatraman (1989):

- The strategic orientation construct focuses on strategy as a means (resource deployment pattern) adopted to achieve the desired goal.

- The construct represents the general strategy needed by a firm in its external environment, which is not based on on one single functional orientation.
- The construct is viewed as a 'realized' strategy and as a 'pattern in a stream of decisions' (Mintzberg, 1978), so that strategies become consistencies in the behaviour of the organization (Mintzberg & Waters, 1982).
- A perceptual approach will be used to operationalize the constructs in terms of managerial perception.

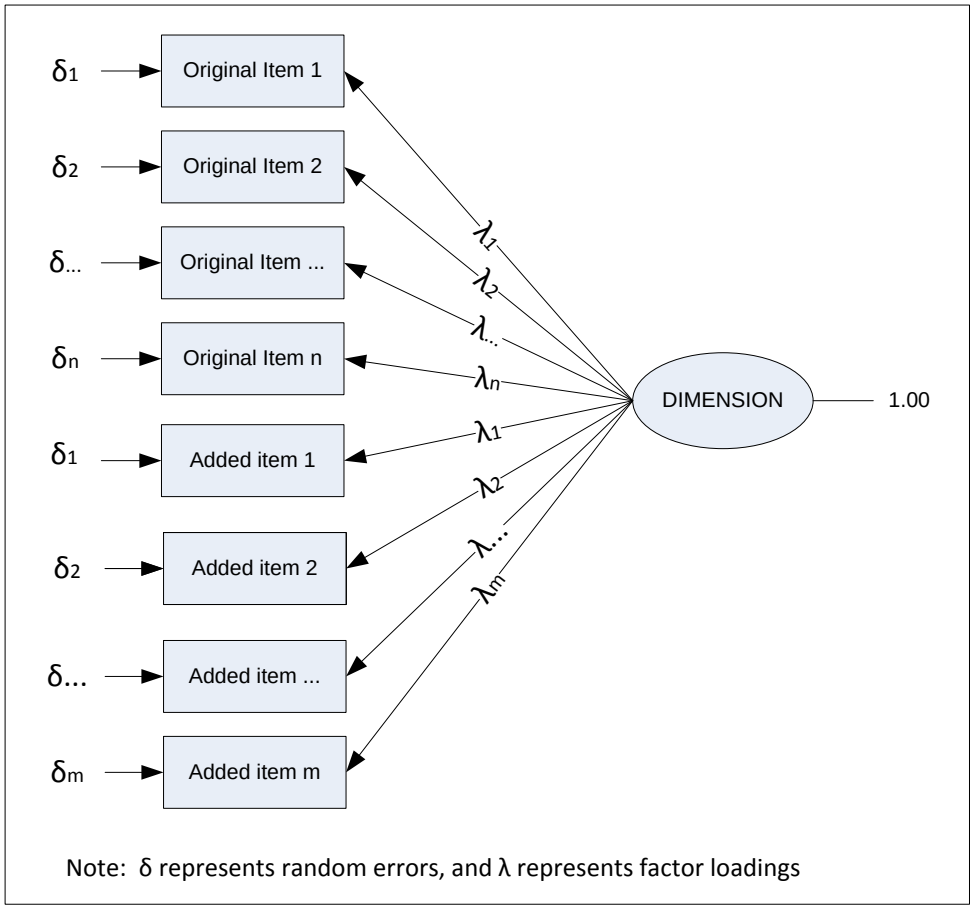

Figure 5.2. Proposed measurement model

To summarize, our extended scale will use the six dimensions of STROBE, as defined by Venkatraman (1989), and we add new items that aim at improving the reflection of a firm's strategic actions in using its internal and external resources. In this way, the extended scale may eventually be better at capturing the key aspects of a firm's strategic action in response to emerging opportunities and threats in its collaborative and competitive environments. In the following section, we systematically develop an extended version of the firm's strategic orientation within a business network.

5.5. Research method and data description

In this section, we explain the method of analysis, including item generation, data collection and a pilot test designed to analyze the extended dimensions of the Venkatraman model. The unit of analysis is the individual form. The empirical context of the test is the software industry in the Netherlands.

5.5.1. Research method

To develop a reliable and valid multi-dimensional measurement of STROBE, we adopted the scale development procedure used by Venkatraman (1989), Anderson and Gerbing (1991), Matsuno and Mentzer (2000), and Froehle and Roth (2004). As shown in **Figure 5.3**, the procedure consists of three main stages: (1) instrument development - item generation, (2) instrument development - item refinement and (3) instrument testing. During the instrument development stage, we start with item generation (1a) based on a literature study, to ensure content validity (Moore & Benbasat, 1991). We evaluate the items that are generated to make sure the right wording and classification of the initial list of generated items is used. We evaluate items using three independent experts (1b), which results in an evaluated list. Next, we refine the evaluate list of items to ensure reliability and validity by assessing their content validity (Froehle & Roth, 2004).

To increase the items' content validity, we carried out a pre-test (2a) with experts to assess substantive validity (Anderson & Gerbing, 1991). This expert survey aims at further refining the evaluated items and reducing ambiguity and bias (Anderson & Gerbing, 1991). We assess items' substantive validity (2b) using inter-rater reliabilities as an analytical tool to assess the degree of agreement among experts. From the assessment, we refine items (2c) by rewording, reclassifying and deleting items. We also conduct interviews (2d) with executives in our targeted segment to further increase validity.

In the instrument testing stage, we empirically tested the reliability and parsimony of our instrument. We performed a pilot survey to collect data for testing the instrument (3a). We prepared the measurement instrument and distributed a self-

administered written questionnaire to the targeted sample, i.e., firms in the Dutch IT-related industry. Following the survey (3b), we performed a confirmatory factor analysis (3c) based on the survey data, to test the internal consistency and reliability of the proposed extended construct. The objective of the survey is to pre-test the extended constructs and to obtain a set of refined indicators for the network orientation aspects that we added to STROBE.

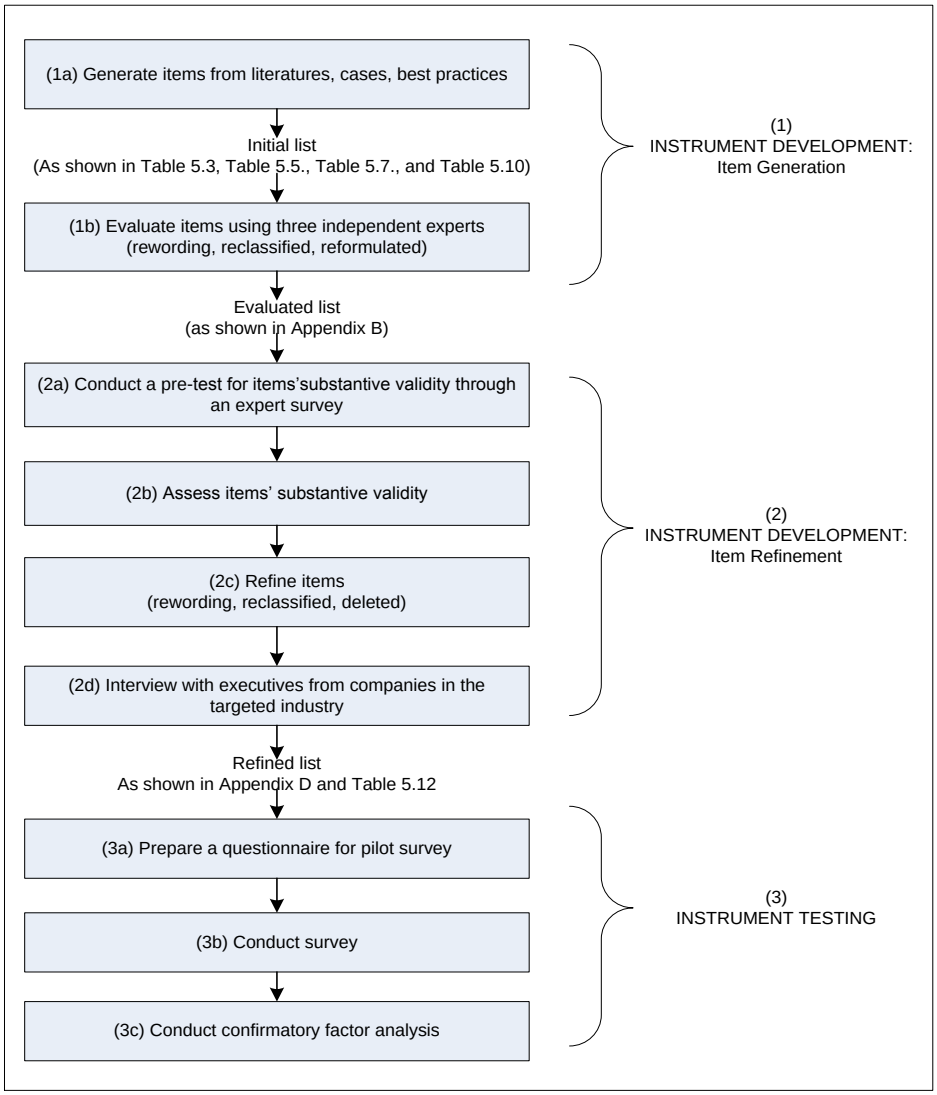

Figure 5.3. Stages taken in developing measurement instrument of strategic orientation in a business network

5.5.2. Data collection

In generating the initial list (stage 1a of Figure 5.3.), we reviewed existing literature to identify concepts, examples and practices showing strategic actions in response to threats emerging from the collaborative environment and the use of external resources. The literature search included research streams in network management, business ecosystems and alliance management. From the literature, study we deductively generated items on the firm's strategy within a business network.

In the item refinement stage, we used an expert survey (2a) using an online questionnaire as shown in **Appendix E**. We administered an online questionnaire to a panel of 51 academic experts whose research areas are in strategic orientation and network strategy/management. Seven of these experts responded to our questionnaire. Each expert was asked to read each item and assign it to the STROBE dimension that in they felt best matched the item (Anderson & Gerbing, 1991). Definitions of each dimension were given to experts. If an item was consistently placed within a particular dimension, we considered it to demonstrate convergent validity with the related construct and discriminant validity with others (Anderson & Gerbing, 1991; Moore & Benbasat, 1991). Assessment of substantive validity (2b)(as shown in **Appendix F**) was done and items were refined (2c). As a final step in instrument development, just prior to instrument testing, we interviewed seven executives for our final measurement model (2d), to check whether practitioners are able to understand the items without ambiguity. The executives range from director, chief financial officer, and head of a business unit, and managing consultants in software firms in the Netherlands. Based on the expert surveys and the interviews, changes, we created a refined list of items that were incorporated in the questionnaire to be used in the instrument testing stage (3a) as shown in **Appendix G**.

We tested the instrument (3b) among Dutch software-related firms, which are different from the ones we used in **Chapter 3** and **Chapter 4**. Although they are all Dutch firms, they show similarities in terms of facing the same industrial context, i.e., high-technology and the use of collaboration in an international environment. The data for this study was collected using a paper-based and online questionnaire as shown in **Appendix H**. In the paper-based questionnaire, we drew samples of directors of IT-related firms in the Netherlands from LexisNexis Company Dashboard. After checking for duplicates in the database, we found 358 unique firms. We received 22 usable responses (6.1% response rate), which included 6 (six) responses from the interviews, 13 responses from the mail, and 3 (three) additional responses from second reminders. Before the second reminders, we made a telephone call to check the 245 firms we were able to

reach, 51 firms wanted to participate, 57 firms did not want to participate, 78 firms could not assign to the targeted respondent, 56 firms told us we had the wrong address, and three firms said that they had not received the questionnaire.

To increase the response rate, we conducted an online survey for Dutch IT-related firms. We firstly sent the online survey to 35 firms. We got 5 complete and 1 incomplete responses. We continued the online survey to a larger sample. Samples were drawn from Reach Database from Bureau van Dijk to generate a list of 560 firms. Avoiding duplicates from the first stage, we ended up with 248 firms. We called these firms by telephone to ask for their cooperation. 132 firms were willing to cooperate. E-mails with a link to the questionnaire were sent to these 132 firms. In total, we received 32 completed questionnaires (response rate of 11.0%) and 21 incomplete questionnaires with this online survey. This means that, overall, we received 54 usable responses out of 641 firms, representing a total response rate of 8.4%. This response rate is relatively low, which may be due to the length and difficulty of the questionnaire and the required participation of an executive. The number of responses allows us to analyse the unidimensionality and reliability of the dimensions. We used the 54 responses for further analysis[9].

Based on the 54 completed responses, we analyzed the data (stage 3c of Figure 5.3) to examine the underlying structure among items, and assessed the degree to which the items met the structure we proposed in the previous section of this

[9] To examine the extent of sample bias of the responses from these two stages, we conducted an independent t-test, to examine whether the two samples are independently obtained from the same target population. The profiles of the two samples are compared along firms' characteristics. As the focus of the study is a firm's strategic orientation, the informants' characteristics are important to observe. The characteristics we examined were age, size and business domain. From the t-test of firm age, we found that, on average, samples from the first stage are older (M=18.550, SE=1.953) than samples from the second stage (M=15.472, SE=1.946). This difference was not significant $t(54)=1.028$, $p>0.05$ (sig=0.308). The effect size is also considered to be small r=0.138. From the t-test of firm size, we found that, on average, samples from the first stage are bigger (M=4473.26, SE=3407.7) than samples from the second stage (M=108.21, SE=24.77). This difference was not significant $t(45)=1.563$, $p>0.10$ (sig=0.125). The effect size is also considered to be small r=0.22. From the t-test of firm business domain, we found that the two samples differ along size distribution ($X^2=10.514$, df=2; $p<0.005$). As for informant characteristics, we examined their strategic positions in the firms, the length of their tenure in the respective firms. From the t-test of respondent positions, we found that the two samples do not differ along categories of strategic position ($X^2=2.720$, df=2; $p<0.257$). From the t-test of informant's holding position, we found that, on average, samples from the first stage have shorter time in holding their current position (M=6.07, SE=1.59) than samples from the second stage (M=7.84, SE=1.73). This difference was not significant $t(55)=-.749$, $p>0.10$ (sig=0.457). The effect size is also considered to be small (r=0.10). We conclude that the samples have drawn from the same "broad population" and that the extent of bias is insignificant in terms of firm and informant characteristics. Hence, the analysis is assessed by pooling the two samples together.

paper (Hair et al., 2006). We used confirmatory factor analysis, since the dimensions were developed *a priori* (Froehle & Roth, 2004; Hair et al., 2006; Venkatraman, 1989). When a model showed a poor fit in the Confirmatory Factor Analysis (CFA), we continued with Exploratory Factor Analysis (EFA) to explore alternative models. We describe this process in detail in **Section 6**.

5.6. Instrument development: item generation

The objective of this stage is to generate a first list of items for strategic orientation. We follow the main premise of the RBV, asserting the importance of resources to a firm's competitive advantage, which is continuously maintained through strategic actions that are mainly concerned with enhancing and protecting the VRIN conditions of the firm's resources. Firms are involved in business networks. They accumulate resources from their partnerships, reconfigure them with their internal resources and use them in their strategic actions. Therefore, we revisit the dimensions of a firm's key strategic traits. Based on the conceptualization of each dimension, we reviewed existing literature to identify concepts, examples and practices showing strategic actions to respond to threats emerging from the collaborative environment and the use of external resources. We do so along the lines of the dimensions of a firm's key strategic traits. From this literature study, we deductively generated items on firm strategy in a business network.

Thus, at this stage, item generation was guided by the conceptualization of the six dimensions of a firm's strategic orientation. The basic principle is to have items that are representative of each particular dimension. These items are selected for their appropriateness, uniqueness and ability to convey to informants the different aspects of a firm's strategic orientation in a business network.

5.6.1. Futurity

Futurity reflects a firm's temporal consideration in terms of the relative emphasis on effectiveness versus efficiency. It is related to a firm's responses to competitive futures and potential changes in its competitive landscape. It is an important dimension of a firm's strategy to support organizational preparedness, which maintains a role in reducing corporate anxiety about competitive futures and providing a foothold to understand the pattern, form and extent of potential changes in a firm's competitive landscape (Courtney et al., 1997).

Futurity reflects a firm's trait of having visions about the future competitive landscape and sharing them with other members of its network. Creating such visions requires formal mechanisms to track and forecast general trends in both the competitive and collaborative environments. We concluded that the *Futurity*

items, as used by Venkatraman (1989), Morgan and Strong (2003) and Byrd et al. (2006) are general traits that are needed to respond to threats in the external environment and applicable to both internal and external resource allocations. *Futurity* is related to vision about the future of a firm's external environment, which is important to maintain a firm's fit with this environment. Both in a firm's competitive and collaborative environments, it needs to search for new information, scan new developments and predict what the future might look like. These traits are reflected in the original items and no additional items are needed, as shown in **Table 5.2.**

Table 5.2. Original items reflecting the *Futurity* dimension

No.	Items	References
1.	We carry out long-term research to provide us with a future competitive advantage	Venkatraman, 1989 ; Byrd et. al, 2006
2.	Our criteria for budget allocations generally reflect short-term considerations	Byrd et.al, 2006
3.	We often conduct "what-if" analyses of critical issues	Byrd et.al, 2006 Venkatraman, 1989
4.	Formal tracking of significant general trends is common	Venkatraman, 1989; Morgan & Strong,2003
5.	Forecasting key indicators of operations is common	Venkatraman,1989; Morgan & Strong, 2003

5.6.2. Pro-activeness

This dimension involves a firm's proactive traits to participate in emerging industries, continuously search for market opportunities and experiment with potential responses to the changing competitive landscape (Venkatraman, 1989). It reflects a firm's willingness to shape and exploit emerging opportunities, to experiment with change, and to mobilize first-mover advantages (Dess, Lumpkin, & Covin, 1997; Lynn, Morone, & Paulson, 1996; Morgan & Strong, 2003) as reflected by the items in **Table 5.3**. We argue that these items do not sufficiently reflect the range of a firm's strategic actions in its collaborative environment.

Table 5.3. Original items reflecting the *Pro-activeness* dimension

No.	Items	References
1.	We are constantly seeking new opportunities related to present operation	Venkatraman, 1989; Morgan & Strong, 2003
2.	We are usually the first ones to introduce new brands or products in the market	Venkatraman, 1989; Morgan & Strong, 2003
3.	We are constantly looking for businesses that can be acquired	Venkatraman, 1989; Morgan & Strong, 2003
4.	Operations in later stages of the life cycle are strategically eliminated	Venkatraman, 1989; Morgan & Strong, 2003

Being embedded in competitive and collaborative environments, firms face the threat of losing their competitive advantage when their existing resources (e.g., technological assets or know-how) become obsolete (Afuah, 2000). A firm's proactive actions reflect the way it responds to this by continuously challenging itself in pursuing emerging opportunities both in its competitive and in its collaborative environments. In such environments, we would expect, as Burt (1995) and Uzzi (1997) argue, that a firm's orientation with regard to having connections with partners in different domains facilitates the firm's wider search for new opportunities. *Pro-activeness* is also about forward looking and initiating actions to look for new opportunities; it is about having access to knowledge about future demands and new developments/advances, both inside and outside the firm's current domain. In this way, a firm can take advantage of a broader scope of information to maintain and enhance its competitive advantage (Hoffmann, 2007).

As shown in **Table 5.4**, we identified and generated items reflecting the *Pro-activeness* of a firm's strategy/strategic actions that use external resources. The first item is related to a firm's proactive trait to find and shape new opportunities. New opportunities can also be found in new partnerships that provide complementary resources for serving new markets or creating new products. Thus, a firm systematically changes its position in the network by combining its existing partnerships in new ways or building new partnerships to create new value chains (Low, 1997). These efforts represent a firm's strategic orientation to flexibly and quickly acquire resources in new areas and subsequently coordinate and develop new markets with prominent leaders/client in its respective markets (Jorgensen & Vintergaard, 2006), as stated in the first item.

Firms create partnerships with prominent partners to add complementary resources that enhance their competitiveness level. A firm can proactively create partnerships with firms out of its own domain, opening up the possibility of seizing emerging opportunities. As for the second item, having similar interests in pursuing opportunities, firms connected in a network co-evolve, bringing together their unique resources (Iansiti & Levien, 2004; Moore, 1996). In this sense, firms proactively shape and create opportunities with their partners and ensure that all interests are served. Pro-active firms look for synergies and develop new resources (Hitt et al., 2001) or new know-how to do so in their collaborative environment (Ireland et al., 2002). Being connected with partners with diverse resources, a firm can proactively start innovative initiatives that lead to competitive new products or the exploration of new markets (Byrd et al., 2006; Low, 1997; Moore, 1996), as stated in the third item.

New opportunities can be found outside a firm's core business. Having partnerships with organizations outside its core business triggers new opportunities or ideas, reflecting a firm's proactive trait, as stated in the fourth item (Jorgensen & Vintergaard, 2006; Poulymenakou & Klein, 2006; Low, 1997). New opportunities can also be found in a firm's existing network by identifying unmet needs, fragmented and underutilized resources, new solutions for customers, and inventing new value chains that bring resources of partners together in creative ways (Byrd et al., 2006; Moore, 1996) as stated in the fifth item.

Table 5.4. Generated added items reflecting the *Pro-activeness* dimension

No.	Items	References
1.	We create strategic relations with prominent client/leaders in different domains which might be long term and personal to ensure reaching the commercial level	Jorgensen & Vintergaard, 2006
2.	We establish a framework of co-evolution that brings together the competencies of many firms and then help these communities to grow	Moore, 1996; Iansiti & Levien, 2004; Poulymenakou & Klein, 2006
3.	We work with different partners to bring new ideas to invest in new resources, activities, and partners to the existing network	Low, 1997; Moore, 1996; Byrd et.al, 2006
4.	We develop an array of informal relationships with organizations that currently are outside our core business area	Low, 1997; Jorgensen & Vintergaard, 2006; Poulymenakou & Klein, 2006
5.	We identify powerful, unmet needs and fragmented, underutilized resources and invent new value chains that bring resources and needs together in creative ways	Moore, 1996; Byrd et.al, 2006
6.	We actively monitor our environment and gather information to identify partnering opportunities	Kandemir et.al, 2006

Many times, new opportunities emerge from advances in segments or industries that are outside the firm's current segments or industry (Jorgensen & Vintergaard, 2006; Low, 1997; Poulymenakou & Klein, 2006). Being alert to such advances and developments requires a proactive trait. Firms that actively monitor their direct and indirect partners will stay alert to such developments and can potentially create synergies with their current resources (Kandemir, Yaprak, & Cavusgil, 2006), as stated in the last item. In this sense, they proactively prepare themselves for competitive changes.

5.6.3. Defensiveness

This dimension captures the defensive trait of an organization through the extent to which it engages in cost reduction and efficiency seeking methods (Venkatraman, 1989). As illustrated in **Chapter 4**, an example of this is shown by a firm's exploitation of its existing resources, by operating in multiple vertical industries, as done by Autodesk and SAP. *Defensiveness* is about gaining prominence within existing segments or industries rather than new product/market development (Miles & Cameron, 1982). This focus enables firms to develop composite strategies to outperform less domain-focused firms (Hart & Banbury, 1994; Morgan & Strong, 2003). *Defensiveness* reflects a firm's efficiency-seeking and core competencies-maintaining orientation, as shown in **Table 5.5**.

Table 5.5. Original items reflecting the *Defensiveness* dimension

No.	Items	References
1.	We occasionally conduct significant modifications to manufacturing technology	Venkatraman, 1989; Morgan & Strong, 2003
2.	We often use cost control systems for monitoring performance	Venkatraman, 1989; Morgan & Strong, 2003
3.	We often use production management techniques	Venkatraman, 1989; Morgan & Strong, 2003
4.	We often emphasize product quality through the use of quality circles	Venkatraman, 1989; Morgan & Strong, 2003

However, these items have a tendency to involve a firm's internal resources only and leave out external resources. Firms that show defensive behaviour will seek control of their resources, be they core or complementary, and continuously improve them to maintain their competitive advantage. In this way, a firm protects its source of competitive advantage from environmental threats. Protecting the VRIN conditions through defensive orientation is also reflected in actions designed to ensure efficiency, which makes the firm's internal resources more valuable compared to those of its competitors. In their collaborative environment, firms look for creative ways to make better use of and integrate the benefits from external resources to optimize value creation at minimum cost. The items that reflect a firm's defensive strategic actions based on external resources are shown in **Table 5.6.**

In a search of complementary resources, firms create partnerships with other firms, which entail costs that may reduce the VRIN conditions of their resources. The first item reflects a firm's efficiency seeking by investing in strong and long-term partnerships (Low, 1997). In a long-term partnership, a firm has established routines that reduce cost compared to creating new partnerships. Systematically coordinated strategies (Kandemir et al., 2006), as stated in the second item, also

reflect this. Having coordinated strategies is likely to make firms use their resources efficiently. As for the third item, encouraging a firm's employees to interact with partners means encouraging them to engage in creative ways to realize an improved resource mobility, which requires strong and redundant relationships with which a firm can maximize the benefit of the resource exchange at minimum costs (Hoffmann, 2007), and informal networks, within which efficient resource exchange happens (Gupta, 2006). Productivity is highly related to a firm's efficiency-seeking trait.

Table 5.6. Generated added items reflecting the *Defensiveness* dimension

No.	Items	References
1.	We invest in network position by maintaining and investing in a number of strong, long-term business relationship with its partners	Low, 1997
2.	We systematically coordinate our strategies across different relationship	Kandemir et.al, 2006
3.	We encourage our employees to interact with employees of our partner organization in informal settings even outside of work	Gupta, 2006
4.	We increase productivity by simplifying the complex task of connecting network participants to each other and by making the creation of new products by other parties	Iansiti & Levien, 2004
5.	We maintain tight coupling with our direct connections to manage risks and dependencies	Iansiti & Levien, 2004 Capaldo, 2007
6.	We maintain loose coupling with indirect connections to embrace mobility and flexibility.	Iansiti &Levien, 2004 Capaldo, 2007
7.	We ensure that it is privy to the relevant development of activities of network members that there is no attempt to "cheat" by the partners and that innovations are not leaked to actors who are linked to competing networks	Dhanaraj & Parkhe, 2006 Uzzi, 1997
8.	We create multiple knowledge sharing processes and sub-networks in the larger network	Dyer &Nobeoka, 2000 Dhanaraj &Parkhe, 2006
9.	We seek to do a better job of meeting needs that are already being addressed, with resources that are already harnessed	Moore, 1996 Uzzi, 1997

The fourth item involves a firm's efforts to increase productivity by increasing efficient transfer and creating new products through partnerships. In addition, to protect the VRIN conditions of their resources, firms take advantage of their external resources to manage risks, embrace mobility and flexibility (Iansiti & Levien, 2004). A firm can show a defensive trait in managing risks that could potentially reduce the VRIN conditions of its resources. Firms may face the risk of losing their important partners, since strategic partners can leave a firm's

network, which may make the competitive advantage of a firm's current network obsolete. It is, thus, important to ensure the continuity of partnerships around the firm's current technological platform or subsequent technological trajectories. Dual governance of a firm's business network in the form of tight coupling and loose coupling with a firm's partners is a mechanism that firms use to protect their VRIN conditions (Capaldo, 2007). A tight coupling with their direct partners enables firms to govern their partnerships efficiently, while a loose coupling with their indirect partners enables them to be more flexible in escaping from obsolete relationships (Iansiti & Levien, 2004), as reflected in the fifth and sixth items.

The collaborative environment creates threats with regards to network partners' opportunistic behaviour and with regard to dependency, when a network partner takes away the potential of commercialization of new ideas unfairly or takes advantages of the openness of other actors in the network (Iansiti and Levien, 2004). In response to this, firms create defensive mechanisms, which ensures a fair distribution of value and mitigate appropriability concerns among members of the network (Dhanaraj & Parkhe, 2006). These mechanisms rest on trust building, clear communication and pre-established sanctions, rather than on lengthy contracts and potential litigation (Uzzi, 1997). The seventh item reflects this defensive trait in discouraging opportunistic behaviours.

A focus on efficiency in a firm's attempts to access external resources is related to maintaining resource mobility, which is defined as the ease and efficiency with which resources are shared, acquired and deployed within a firm and its network (Dhanaraj & Parkhe, 2006). That focus may affect a firm's efficiency relative to its competitors. Multiple knowledge sharing processes and managing a firm's network in terms of sub-networks means allocating appropriate resources to specific conditions, to meet specific objectives reflecting a firm's efficiency-seeking trait, as stated in the eight item. The last item reflects a firm's exploitation of existing resources to serve existing demand in the market (Moore, 1996; Uzzi, 1997).

5.6.4. Analysis

This dimension refers to the tendency of a firm to search for the roots of problems and opportunities, to generate the best possible solutions (Venkatraman, 1989). It reflects a firm's knowledge-building capacity (Burgeois, 1980) and enables processes for organizational learning (Cohen & Sproull, 1996). It is a firm's approach to problem-solving, which is secured by understanding both the internal and external environmental contexts (Miller & Friesen, 1984). As it reflects problem-solving, the *Analysis* dimension should be characterized by comprehensiveness and consistency. Thereby, it is important for firms to acquire a deep understanding of their internal organization and external environment,

which can be acquired by having high quality, reliable information. This, in turn, requires a firm to develop an activity system and analytical system that can ensure coordination among different functional areas, and to use knowledge management systems, information and control systems, or competitive intelligence systems to support decision-making, as shown in **Table 5.7.** (Venkatraman, 1989).

Table 5.7. Original Items reflecting the *Analysis* dimension

No.	Items	References
1.	We emphasize effective coordination among different functional areas	Venkatraman, 1989; Morgan & Strong, 2003
2.	We require a great deal of factual information to support our day-to-day decision making	Venkatraman, 1989; Byrd et.al, 2006
3.	We tend to be highly analytical in our decision making	Venkatraman, 1989; Byrd et.al, 2006
4.	We use several planning techniques	Venkatraman, 1989; Morgan & Strong, 2003
5.	We use the outputs of management information and control systems	Venkatraman, 1989; Morgan & Strong, 2003
6.	We commonly use manpower planning and performance appraisal of senior managers	Venkatraman, 1989; Morgan & Strong, 2003

The original items have a tendency to focus on internal processes and work flows and on internal information sharing. In addition, firms strategically analyze their partners and interact with their partners, and during these interactions, they transfer and share resources and knowledge, as done by SAP through its ecosystem partners. As we found in **Chapter 4**, SAP benefits from its competence in enterprise application software. The company set up a system to have an efficient information transfer in the organization, to facilitate learning, as well as created platforms that facilitate efficient interaction among its large scale partners, which does not only benefits the firm itself but also its partners (Hagel & Brown, 2008). These platforms were and still are used to manage partners, to provide certifications and enable services to developers' complementary solutions and services offerings, and to set up a structured partner program (Iansiti & Lakhani, 2009). The net benefits that the firm can gain from these interactions depend on its absorptive capacity or learning orientation (Dyer, Kale, & Singh, 2001; Powell et al., 1996; Tsai & Ghoshal, 1998). The challenges of a firm's learning about the collaborative environment are related to having good quality external resources and ensuring the acquisition of resources inherent in the portfolio of partnerships, to support decision-making.

Following the arguments provided in literature, we generated seven additional items that reflect the analysis trait when dealing with resources in a business

network. Thus, to maximize the net benefits from their external resources, firms have to show analytical traits with respect to these external resources, as shown in the items in Table **5.8**. The first item reflects a firm's analytical trait based on the availability of carefully designed process interfaces to ensure the quality and acquisition of information or knowledge from such a resource exchange between a firm's and its partners (Riemer & Klein, 2006), which will support efficient learning (Ireland et al., 2002). Such interfaces and governance structures that connect partners represent a shared understanding about the partnerships, which enhances trust and, thus, learning (Ireland et al., 2002; Lane & Lubatkin, 1998).

Table 5.8. Generated added items reflecting the *Analysis* dimension

No	Items	References
1.	We carefully design process interfaces and contribute to the network resource pool which enables us to link our resources and activities into the overall value creation of the network	Riemer & Klein, 2006
2.	We conduct periodic reviews of our relationships to understand what we are doing right and where we are going wrong	Kandemir et.al, 2006; Gupta, 2006
3.	We examine our existing network positions and the need to develop new ones	Low, 1997
4.	We ensure integration of network benefits and of external resources offered by other partners into internal operation	Riemer & Klein, 2006 Hoffmann, 2007
5.	We proactively reduce uncertainty by decreasing information gaps and providing crucial context for players in its network	Iansiti & Levien, 2004
6.	We assess the value of relevant knowledge residing at different points in the network and can arrange its transfer to other points in the network when it is needed	Dhanaraj & Parkhe, 2006
7.	We critically and openly review our social, intellectual, human, technological, and financial investments and its return before a decision to invest further into the development of a relationship is made	Low, 1997; Poulymenakou & Klein, 2006

Interfaces and governance structures will strengthen partnerships, which, in turn enables firms to invest in deep understanding of partners' resources and in that way ensure integration of these external resources with its internal resources and with the complementary resources around it (Hoffmann, 2007). Learning can be also be obtained by (1) conducting reviews on a firm's current practices (Gupta, 2006; Kandemir et al., 2006), as stated in the second item, or (2) examining/evaluating a firm's current position before engaging in further actions (Low, 1997), as stated in the third item. Obtaining the benefits from having partnerships requires good integration of external resources or information into a firm's internal operation (Riemer & Klein, 2006), as stated in the fourth item. This also reflect a firm's analytical trait, since integration requires firms to analytically

review and select which resources or information provide benefits and fit with their internal operations (Riemer & Klein, 2006). The fifth item reflects a firm's analytical trait by reducing information gaps and providing a crucial context for all partners (Iansiti & Levien, 2004). Having a reduced information gap and knowing the context makes it easier for firms to learn. A firm needs to ensure knowledge mobility to improve learning (Dhanaraj & Parkhe, 2006), by assessing relevant knowledge residing in different partners and transferring it as needed, as stated in the sixth item. The last item reflects a firm's analytical trait by having a critical and open review of the resources, before developing new relationships, especially due to the fact that partnerships may be costly and risky (Low, 1997; Poulymenakou & Klein, 2006).

5.6.5. Aggressiveness

Aggressiveness reflects a firm's orientation in allocating its resources to improve its market position (Venkatraman, 1989). It reflects goal-oriented actions adopted by a firm in allocating its resources to improve its market position at a relatively faster rate than the competition (Clark & Montgomery, 1998; Venkatraman, 1989). *Aggressiveness* reflects a firm's combative attitude to gain or maintain its leadership in response to market trends (Dess et al., 1997). Therefore, it shows the propensity to directly and intensely threaten other firms to improve one's market position. It is a firm's aggressive response designed to maintain and increase its dominance/position, which materializes in aggressive actions, e.g., cutting prices or setting prices below those of the competition. In this way, short-term objectives or existing gains (e.g., profits) are sacrificed to reap long-term objectives (e.g., market share or growth). **Table 5.9** shows the original items reflecting *Aggressiveness* (Morgan & Strong, 2003; Venkatraman, 1989).

Table 5.9. Original items reflecting the *Aggressiveness* dimension

No.	Items	References
1.	We often sacrifice profitability to gain market share	Venkatraman, 1989; Morgan & Strong, 2003
2.	We often cut prices to increase market share	Venkatraman, 1989; Morgan & Strong, 2003
3.	We often set prices below competition	Venkatraman, 1989; Morgan & Strong, 2003
4.	We often seek market share position at the expense of cash flow and profitability	Venkatraman, 1989; Morgan & Strong, 2003

As shown in **Table 5.9**., these items have a tendency towards an internal orientation on a firm's resources and internal actions. Since external resources become an integral part of a firm (Jorgensen & Vintergaard, 2006), newly generated items should reflect the strategic use of a firm's external resources or

firms' combative posture to gain better market positions. We added five items as presented in **Table 5.10**.

The first item of Table **5.10** represents a firm's realized strategies, which are likely the result of its combative orientation to trade off external resources with market growth or position. Dissolving a long-term relationship with partners reflects a firm's aggressive trait in realizing growth/position (Jorgensen & Vintergaard, 2006). Long-term relationships are valuable, the parties involved have invested much and have developed mutual understanding. The second and third items show a firm's combative rivalry with regard to its competitors through managing dependence (Moore, 1996), by exercising strong bargaining power in relation to its key partners, as stated in second item, or by blocking other firms from rendering the value of the whole network, to maintain dominance in its external environment, as stated in third item (Dhanaraj & Parkhe, 2006; Iansiti & Levien, 2004; Moore, 1996). The fourth item reflect a firm's sacrifices to improve its market position faster than its competitors (Venkatraman, 1989), and a willingness to dedicate whatever resources needed to create a strong product positioning and obtain the market lead (Gupta, 2006; Iansiti & Levien, 2004; Moore, 1996). The fifth item reflects a firm's aggressive attitude to avoid being dependent on its partners, which may sacrifice its long-term interest (Moore, 1996).

Table 5.10. Generated added items reflecting the *Aggressiveness* dimension

No.	Items	References
1.	We abandon existing long term relationships when new opportunities arise and other changes make current relationships obsolete	Jorgensen & Vintergaard, 2006
2.	We maintain strong bargaining power in relation to other players in the ecosystem-including key customers and valued suppliers	Moore, 1996
3.	We block other companies' attempts to clone our contributions and/or to join with opposing leadership and visions for the whole, that may render our contributions less valuable	Dhanaraj & Parkhe, 2006; Iansiti & Levien, 2004; Moore, 1996
4.	We are usually willing to dedicate whatever people and resources it takes to ensure that your approach is the market standard in its class trough dominating key market segments	Gupta, 2006; Iansiti & Levien, 2004; Moore, 1996
5.	We become a savvy buyer, resisting excessive dependence upon other members of the system-and insist that the overall ecosystem structure reflect substantial customer interests	Moore, 1996

5.6.6. Riskiness

This dimension captures how a firm deals with risks in various resource allocation decisions, as well as its choice of products and markets (Venkatraman, 1989). It acts as a key parameter in determining the decision-making processes involved in a firm's strategy (Dickson & Giglierano, 1986). Firms showing this strategic trait combine the entrepreneurial skills of constructive risk-taking with opportunistic venture-seeking activities (Baird & Thomas, 1990).

There are always risks inherent in a firm's competitive and collaborative environments. In the collaborative environment, risk is related to opportunistic behaviours that may impede the achievement of partnerships goals (Ireland et al., 2002). A firm's response to such inherent risks is thus an important strategic trait. Being risk prone combined with good analytical trait will enable firms to maintain and enhance their competitiveness. Similar to the *Futurity* dimension, we concluded that the items used by Venkatraman (1989), Morgan and Strong (2003) and Byrd et al. (2006) with regard to the *Riskiness* dimension are general traits that are needed to respond to threats in the external environment and that apply to internal as well as external resource allocations. The items for the *Riskiness* dimension are presented in **Table 5.11**.

Table 5.11. Original items reflecting the *Riskiness* dimension

No.	Items	References
1.	In general, our mode of operations is riskier than our competitors'	Venkatraman, 1989; Byrd et.al, 2006
2.	We adopt a rather conservative view when making major decisions	Venkatraman, 1989; Byrd et.al, 2006
3.	Our business operations generally follow 'tried and true' paths	Venkatraman, 1989; Byrd et.al, 2006; Morgan & Strong, 2003
4.	We tend to be risk-averse	Byrd et.al, 2006 ; Venkatraman, 1989

Following the item generation, we continued with evaluating items (stage 1b of Figure 5.3. We asked three independent experts to evaluate the items, to ensure that the formulation and wording were as precise as possible. Based on this evaluation, items were deleted, reworded and reclassified. One item was deleted and replaced with an item that more clearly reflected the dimensions. Three items were reclassified into different dimensions: one item from *Aggressiveness* was reclassified to *Riskiness* and two items from *Defensiveness* were reclassified to the *Aggressiveness* and *Riskiness* dimensions, respectively. New items were also added: three items were added to *Futurity* and two items were added to *Pro-activeness*. The complete results of this evaluation are shown in **Appendix D**.

5.7. Instrument development: Item refinement

As described in **Section 3**, the objective of the item refinement stage is to assess the construct validity of the scale by examining whether items converge into their intended dimension (Moore & Benbasat, 1991). In addition, this step is also important to identify particular items that may still be ambiguous. To assess the construct validity of the items, we conducted an expert survey among academic and industry experts using a web-based survey. The structure of this online questionnaire can be found in **Appendix E**. We provided a refined definition of each of the six dimensions and asked experts to categorize the generated items into one of the dimensions or to mark them as "uncategorized".

We analyzed the results to ensure that we could contribute to construct validity by assessing the substantive validity of the items. Substantive validity is used to assess the extent to which the generated items reflect the dimensions (Anderson & Gerbing, 1991). It attempts to reduce the bias and ambiguity of the items and assess whether the items reflect the intended dimensions. We used two indices of substantive validity, as suggested by Anderson and Gerbing (1991): 1) the proportion of substantive agreement (p_{sa}) and 2) the substantive-validity coefficient (C_{sv}). The proportion of substantive agreement, p_{sa}, measures the proportion of experts who assign the generated items to the pre-defined dimensions. The values range between 0.0 and 1.0, with larger values indicating greater substantive validity because a high proportion of the experts assigned the items to the intended dimension. The formulation of proportion of substantive agreement (p_{sa}) is as follows:

$$p_{sa} = \frac{n_c}{N}$$

where n_c represents the number of experts assigning an item to its posited dimension and N represents the total number of respondents (Anderson & Gerbing, 1991).

The substantive-validity coefficient, C_{sv}, indicates the extent to which an item may also reflect a dimension that is different from the intended one. The values range between -1.0 and 1.0, with larger values indicating substantive validity and negative values indicating that an item has substantive validity, but for a dimension other than the one proposed by the researchers. The formulation of substantive-validity (C_{sv}) coefficient is as follows:

$$C_{sv} = \frac{n_c - n_0}{N}$$

where n_c represents the number of experts assigning an item to its posited dimension, n_0 represents the highest number of assignments of the item to any other dimension in the set, and N represents the total number of respondents (Anderson & Gerbing, 1991).

Analysing the substantive validity, we found a number of items were scoring on low substantive validity, as shown by their low proportion of substantive agreement, p_{sa}, low absolute value of substantive-validity coefficient, $C_{sv,}$ or strongly negative $C_{sv,}$ as shown in **Appendix F**. For example, the item "*we encourage our employees to interact with employees for our partner organization*" has a low proportion of substantive agreement (i.e., $p_{sa} = 0$) and a high negative substantive-validity coefficient (i.e., $C_{sv}= -0.43$), indicating this item has a low substantive validity in the intended dimension (*Defensiveness*), but a high substantive validity in another dimension. For each problematic item, we rechecked the definition and the literature on which it was based. We reworded and re-classified the problematic items. We added these newly developed items to the set of STROBE, as developed and validated by Venkatraman (1989), Morgan and Strong (2003) and Byrd et al. (2006).

We further refined the items by conducting interviews with firm executives (stage 2d of Figure 5.3). The interviews were conducted with seven executives from firms in the IT industry in the Netherlands, who resemble the targeted respondents for our final measurement model. The objective of these interviews was to check whether practitioners are able to understand the items without ambiguity. We asked the executives to fill in the questionnaire on the spot and to provide their feedback at the end of the session. The researcher took notes on the questions they asked while filling in the questionnaire, on items on which they hesitated or that were unclear to them, and on the time required to finalize the questionnaire. The results of the interviews indicated that several items needed to be reworded. The interviews also indicated that executives think that strategic network orientation is important to companies, and they suggested to explicitly include items related to responses to a firm's collaborative environment and external resources. We then implemented the findings from this stage in the questionnaire for a pre-test survey of the construct. The actions taken in this evaluation are presented in **Appendix G.** Completing this stage, we made a revised version of the items, to be used in the instrument testing, as shown in **Table 5.12**. The remarks column summarizes the actions that were taken for each item in the previous stages.

Table 5.12. A revised version of generated items

Codes	Items	Remarks
	FUTURITY	
FUT1	We emphasize the importance of having a balance between maintaining strong and long-standing relationships with creating the new ones	Newly added
FUT2	We routinely follow and/or organize various forums to create a shared vision about the future	Newly added
FUT3	When developing our future in the network, we consider the future needs of our partners	Newly added
FUT4	We balance the needs of our organization with the needs of our partners	Newly added
FUT5	We carry out long-term research to provide us with a future competitive advantage	Original
FUT6	Our criteria for budget allocations generally reflect short-term considerations	Original
FUT7	We often conduct "what-if" analyses of critical issues	Original
FUT8	Formal tracking of significant general trends is common	Original
FUT9	Forecasting key indicators of operations is common	Original
	PROACTIVENESS	
PRO1	We often take initiatives to create strategic relations with prominent clients/leaders in different domains	Minor rewording
PRO2	We establish a framework of co-evolution that brings together the competencies of many firms that helps these communities to develop	Minor rewording
PRO3	We create the possibilities of other firms leveraging, building on, or extending our products	Major rewording
PRO4	We foster knowledge transfer among our business partners when needed	Reclassification and major rewording
PRO5	We consider informal relationships with organizations that currently are outside our core business area	Major rewording
PRO6	We identify unmet needs and invent new value chains that bring resources and needs together in creative ways	Minor rewording
PRO7	We bring new partners into our network to create possibilities for us to tap into their resources, activities, and partners	Reclassification
PRO8	We actively monitor our environment to identify valuable partners	Minor rewording
PRO9	We are always searching for new business opportunities	Original
PRO10	We are frequently looking for business units to acquire	Original
PRO11	We generally expand capacity ahead of our competitors	Original
PRO12	We are usually the first one to introduce new brands or products in the market	Original

Table 5.12. A revised version of generated items (*continued*)

Codes	Items	Remarks
	DEFENSIVENESS	
DEF1	We maintain a number of strong and long-lasting business relationships with our partners	Minor rewording
DEF2	We strongly align our strategies with partners in our networks	Major rewording
DEF3	We encourage our employees to engage into interaction with employees of our partner organizations	No changes
DEF4	We increase productivity by connecting specific network partners to each other	Minor rewording
DEF5	We constantly adapt our specific assets in order to increase the value of the assets provided by our partners	Major rewording
DEF6	We try to meet existing needs with resources that are already exploited	Major rewording
DEF7	We enable efficient knowledge flows by using robust knowledge sharing processes	Major rewording
DEF8	We occasionally conduct significant modifications to our business processes	Original
DEF9	We often use cost control systems for our business processes	Original
DEF10	We often use production (of goods or services) management techniques	Original
DEF11	We often emphasize product (of goods or services) quality through the use of quality circles	Original
	ANALYSIS	
ANA1	We design our processes and resource pool in order to improve the overall value creation in our business network	Major rewording
ANA2	We conduct periodic reviews of our network relationships to understand what we are doing right and wrong	Major rewording
ANA3	We periodically examine our existing business positions and investigate the potential of new partnerships	Major rewording
ANA4	We thoroughly check the benefits from our partnerships before integrating them into our internal operation	Major rewording
ANA5	We collect and share information that provide a context for other members in our network	Major rewording
ANA6	We thoroughly assess the value of relevant knowledge that enters our company before we take action upon it	Major rewording
ANA7	We critically and openly review the benefits of our partnerships and their return before making a decision to continue developing a new relationship	Minor rewording
ANA8	We emphasis effective coordination among different functional areas in our firm	Original
ANA9	We require a great deal of factual information to support day-to-day decision making	Original
ANA10	We tend to be highly analytical in our decision making processes	Original

Table 5.12. A revised version of generated items (*continued*)

Codes	Items	Remarks
ANA11	We use several planning techniques	Original
ANA12	We use the outputs of management information and control systems	Original
ANA13	We commonly use manpower planning and performance appraisal of senior managers	Original
	AGGRESSIVENESS	
AGR1	We abandon existing long-term relationships when they are no longer relevant	Major rewording
AGR2	We focus on exercising a strong bargaining position in relation to our business partners, customers and valued suppliers	Major rewording
AGR3	We often block other companies' attempts to copy our contributions and/or their attempts to oppose us in a way that may render our contributions in the network less valuable	Minor rewording
AGR4	We are willing to dedicate whatever people and resources are necessary to ensure that our approach will become the dominant market standard	Minor rewording
AGR5	We sanction opportunistic behaviour (cheating or leaking information to competitors) in our networks	Reclassification and Major rewording
AGR6	We often sacrifice profitability to gain market share	Original
AGR7	We often cut prices to increase market share	Original
AGR8	We often set prices below competition	Original
AGR9	We often seek market share position at the expense of cash flow and profitability	Original
	RISKINESS	
RIS1	We avoid excessive dependence on other members of the network	Reclassification and major rewording
RIS2	We develop generic assets to increase the scope of our business network	Reclassification and major rewording
RIS3	In general, our mode of operations is riskier than that of our competitors	Original
RIS4	We adopt a (rather) conservative view when making major decisions	Original
RIS5	Our business operations generally follow 'tried and true' paths	Original
RIS6	We tend to be risk-averse	Original

As shown in Table **5.12.,** there are changes in the added items for each dimension as a result of our item generation stage, as summarized in Table **5.13**. With regard

to *Futurity* dimensions, new items (FUT1, FUT2, FUT3, FUT4) were added for network-related orientation. There are now four added items and five original items in the *Futurity* dimension. With regard to the *Pro-activeness* dimension, the added items were given a major (PRO3, PRO4, PRO5) and minor rewording and there were two new added items (PRO 4 and PRO7). One added item is the result of reclassification from the *Analysis* dimension. Thus, there are now eight added items and four original items in the *Pro-activeness* dimension. As for the *Defensiveness* dimension, the added items were given a major (DEF2, DEF5 DEF6 and DEF7) and minor rewording (DEF4), and one of them was moved to the *Aggressiveness* dimension. There are now seven new added items and four original items in the *Defensiveness* dimension. As for the *Analysis* dimension, the added items were given a major (ANA2, ANA 2, ANA3, ANA4, ANA5, ANA6) and minor rewording (ANA7). There are now seven added items and six original items in the *Analysis* dimension. With regard to the A*ggressiveness* dimension, the new added items were given a major (AGR1 and AGR2) and minor rewording (AGR3 and AGR4) and there was one new added item (AGR5). This item is the result of reclassification from *Defensiveness* dimension. Two more added items (RIS1 and RIS2) were reclassified into *Riskiness* dimension. Thus, there are now five added items and four original items in the *Aggressiveness* dimension. As for the *Riskiness* dimension, two items were added. These items were reclassified from the *Aggressiveness* dimension, which means there are two added items and four original items in the *Riskiness* dimension.

Table 5.13. Summary of the results of item refinement

No.	Dimensions	Changes	Total items
1.	*Futurity*	Four new items reflecting network-related items were added	Four added items Five original items
2.	*Pro-activeness*	Major and Minor rewording One added item from analysis dimension	Eight added items Four original items
4.	*Defensiveness*	Major and Minor rewording One added item is reclassified to *Aggressiveness*	Seven added items Four original items
3.	*Analysis*	Major and Minor rewording One added item is reclassified to *Pro-activeness*	Seven added items Six original items
5.	*Aggressiveness*	Major and Minor rewording One added item from *Defensiveness* dimension Two added items were reclassified into *Riskiness*	Five added items Four original items
6.	*Riskiness*	Two added items from *Aggressiveness*	Two added items Four original items

Before the pilot survey, we distributed a self-administered written questionnaire to convenient samples (Stage 3a of Figure 5.3). The samples are three colleagues working in the field of strategic management. They were asked to comment on the length, wording and instruction survey, to ensure the questionnaire had been compiled in an adequate way. Different people were used to enhance the validity and reliability of the surveyor. The questionnaire that was developed to test the instrument can be found in **Appendix H.**

5.8. Instrument testing

The objective of this stage (stage 3b of Figure 5.3.) is to further assess whether our conceptualization of strategic orientation has an appropriate level of construct validity. We assessed model validity[10] and construct validity[11]. The assessment of model fit and construct validity was done through a confirmatory factor analysis in LISREL on the empirical data collected from a survey. We distributed the self-administered written and online questionnaire to a sample of firms, as described in **Section 4**. Due to the small sample size, we could only assess construct validity by testing the convergent validity, the extent to which the items of a specific dimension converge (Hair et al., 2006).

We conceptualized that each dimension consists of a set of original items, taken from Venkatraman (1989), and a set of items measuring network-related orientation, as shown in **Figure 5.2**. We assessed and modified the proposed model by checking for model fit coefficient and item loadings. We deleted problematic items with low loadings (items with standardized loadings below |0.5|). We further inspected the standardized residuals. Because items with high absolute standardized residuals (higher than |4.0|) suggest problems, these items were dropped. Items with standardized residuals between |2.5| and |4.0| need some attention, depending on whether there are other related problems. The items were deleted one by one, until a reasonable model fit was achieved, while the theoretical base was used to guide the model refinement (Hair et al., 2006). After establishing a reasonable model fit, we further analyzed the level of convergent validity, by assessing factor loadings, average variance extracted and reliability (Hair et al., 2006). The statistical results of the confirmatory analysis for each dimension are presented and discussed in the following sub-sections.

[10]Model validity is assessed through indicators of model fit in confirmatory factor analysis to confirm whether our conceptualization is valid.

[11]Construct validity is assessed with four components, i.e., convergent validity, discriminant validity, nomological and face validity.

5.8.1. Model fit

We further examined various indices of model fit, as suggested by Hair et al. (2006), to enable us to carefully draw conclusions on model validity, as shown in **Table 5.14**. Model fit is determined by the correspondence between the observed variance matrix and an estimated covariance matrix resulting from the proposed model (Hair et al., 2006). The null hypothesis for the model fit is that the observed variance and the estimated variance are equal.

We included indices representing absolute fit, incremental fit and parsimonious fit, to enable us to arrive at a comprehensive judgement of the fit (Hair et al., 2006). An absolute fit index assesses how well the specified model fits the observed data, while an incremental fit index assesses how well a specified model fits relative to an alternative baseline model, i.e., the null model, which is a single-factor model with no measurement error (Hair et al., 2006), and a parsimonious fit index is used to diagnose whether model fit has been achieved by "over fitting" the data with too many coefficients.

Table 5.14. Summary of different indicators of model fit

Indicators	Futurity	Pro-activeness	Defensiveness	Analysis	Aggressiveness	Riskiness
Number of items	4	5	*6*	7	8	4
χ^2	2.28	6.38	16.64	15.44	24.28	2.51
Df[12]	2	5	8	13	19	2
p-level	0.32	0.27	0.034	0.28	0.18	0.27
RMSEA	0.052	0.074	0.145	0.061	0.074	0.077
GFI	0.98	0.95	0.90	0.92	0.90	0.98
NFI	0.98	0.95	0.91	0.94	0.91	0.96
CFI	1.00	0.99	0.95	0.99	0.94	0.99
Normed χ^2	1.14	1.28	2.08	1.19	1.27	1.31

A model with an acceptable fit has a non-significant likelihood-ratio chi-square statistic (X^2), at least at a significance level more than 0.05 or 0.10 (Hair et al., 2006). The goodness-of-fit index (GFI) represents the overall degree of fit, as represented by the squared residuals from prediction compared to the actual data. No absolute threshold levels have been established, but higher values indicate a better fit. Degree of freedom represents "the mathematical information available to estimate model parameters" (Hair et al., 2006). Estimation with *df* more than zero indicates that we have sufficient unique covariance and variance terms for the parameters to be estimated, indicating an acceptable model. The

[12] Df is "Degrees of freedom". Too few degrees of freedom might indicate problems which are likely caused by a violation of the three-indicator rule (Hair et.al, 2006)

root mean square error of approximation (RMSEA) is another absolute fit index, indicating the representativeness of the goodness-of-fit that could be expected if the model were estimated on the entire population (Hair et al., 2006). Acceptable values of RMSEA range from below 0.05 as indicative of close fit, while a range of .05 to .08 indicates a fair fit, and greater than 0.10 indicates a poor fit (Hu & Bentler, 2009). The normed fit index (NFI) is a relative comparison of the proposed model to the null model, i.e., a realistic model that all other models should be expected to exceed. A value of 0.90 or higher indicates an acceptable fit (Hair et al., 2006). Since NFI may result in bias in small samples, we used another relative comparison index, i.e., the comparison fit index (CFI), especially since the CFI has been found to be more appropriate for smaller samples (Rigdon, 1996). As for NFI, higher values indicate a better fit (Hair et al., 2006). The normed chi-square is used to assess inappropriate models; (1) an "overfitted" model, as shown by values less than 1.0, and (2) a model that needs improvement, since it is not yet representative of the observed data, as indicated by values greater than 2.0 or 3.0 (Hair et al., 2006).

An assessment of the chi-square statistics allows us to conclude that the revised models of each dimension show a good fit. However, this conclusion should be drawn carefully, due to the fact that we have small samples and a large number of indicators. Small samples have a tendency to have non-significant chi-square, while a large number of indicators tends to result in a significant chi-square. Thus, we investigated more indices of fit. We can see that the GFI (Goodness-of-fit index) of all dimensions is above the accepted level (>0.90). Except for *Defensiveness*, the RSMEA of all dimensions are in the range of 0.05 and 0.08, which indicates a fair fit of the models (Hu & Bentler, 2009). The assessment of the incremental fit indices allows us to draw the conclusion that all dimensions show a good fit. For all models, the NFI (normed fit index) and CFI (confirmative fit index) are above the generally accepted level (>0.90), which can be associated with a good fit of the specified models. However, due to our small sample size and large number of indicators, we would use the 0.95 level. Using this level, we found that *Aggressiveness, Analysis* and *Defensiveness* dimensions show poor fit. The assessment of the parsimonious fit index (normed chi-square) supports the findings obtained from the RMSEA assessment. The normed chi-square value for *Defensiveness* falls just outside the recommended range (i.e. between 1.00 and 2.00), indicating only conditional support for this model.

We further assessed the validity of the measurement model, which can be assessed through convergent validity, which measures the extent to which each item has a high correlation with other items measuring the same construct (Hair et.al, 2006). We assess the convergent validity of each dimension in the proposed models using different indicators, as shown in **Table 5.15.** We used three

indicators, as suggested by Hair et al. (2006): factor loadings, variance extracted and construct reliability. The higher the value of each indicator (more than 0.70), the higher the convergence of items on each respective dimension is. High construct reliability (over 0.6 or 0.7) indicates that there is internal consistency, which means that the measures all consistently represent the same underlying dimension, or converge into its respective dimension (Hair et al., 2006). Variance extracted is a summary indicator of convergence. Low variance extracted (less than 0.5) indicates that more error remains in the items than variance explained by the dimension (Hair et al., 2006).

Table 5.15. Summary of convergence validity assessment

Dimension	Number of items	Loadings*	Construct Reliability	Variance Extracted
Futurity	4	+	**0.86**	**0.62**
Pro-activeness	5	+	**0.81**	**0.68**
Defensiveness Added (Network-related)	3	+	**0.85**	**0.66**
Defensiveness Original (Venkatraman)	3	+	**0.84**	**0.64**
Analysis Added (network-related)	4	+	**0.81**	**0.60**
Analysis Original (Venkatraman)	3	+	**0.79**	**0.65**
Aggressiveness Added (network-related)	4	-	**0.64**	**0.46**
Aggressiveness Original (Venkatraman)	4	+	**0.42**	**0.42**
Riskiness	4	-	**0.74**	**0.51**
* (+) sign indicates that all items in the dimension have loadings of more than (0.60), while (-) indicates that one or more items in the dimension have loadings less than (0.60)				

As can be seen in **Table 5.15**, we can generally conclude that the construct validity of all dimensions in the models is good, except for the *Aggressiveness* dimension and, to a lesser extent, the *Riskiness* dimension. We can see that the *Aggressiveness* dimension may have consistency problems. As for the *Riskiness*, we could not test for an alternative model with two dimensions, since we only had a limited numbers of network-related items. The variance extracted for both dimensions was on the threshold of what is still acceptable (i.e., around 0.50). Taken together, these three indicators and item loadings provided no support of internal consistency for the *Aggressiveness* and *Riskiness* dimensions.

Based on the conceptualization and empirical findings, we had mixed findings on our attempt to explicitly incorporate network-related orientation into a firm's strategic orientation in terms of our initial expectation. The original items are consistent, but not all the additional items, i.e., network-related items, converge in the same dimensions as the original items. We previously expected that the additional network-related orientation items would load on the same dimensions as the original strategic orientation items. We found that, for *Futurity* and *Pro-*

activeness, the original and added items did load on the same dimension. For *Aggressiveness*, *Analysis* and *Defensiveness*, the original and added items diverge into two separate dimensions. As for *Riskiness*, the additional network-related items did not produce significant loadings. Nevertheless, due to our limited sample size, we cannot definitely conclude which approach, single-dimensional or two-dimensional models, is better. Theoretically, we could argue in favour of both models, which will be discussed next.

5.8.2. Futurity

The *Futurity* dimension, which represents a firm's long-term orientation, was hypothesized as being composed of five original items and four network-oriented items. The hypothesized single-dimension model indicates a low model fit ($p=0.00$; $X^2 = 67.43$; $df=27$). A two-dimensional model did not provide a better model fit and a high positive correlation (i.e., 0.50) between the two dimensions. Therefore, we refined the one dimension model through iterative steps, until further improvement had no effect, which resulted in the refined model shown in **Figure 5.4**.

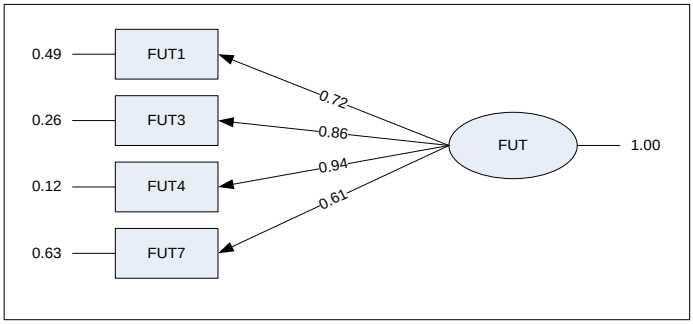

Figure 5.4. Refined model for *Futurity* dimension

As shown in **Table 5.16**, the chi-square and RSMEA indicate that the refined model provides a good fit ($p=0.32$; $X^2 = 2.28$; $df=2$). Furthermore, the ML estimates for all items are statistically significant at $p<0.001$. Thus, we can say that this empirical analysis strongly suggests a 4-item single-dimension model, as shown in **Figure 5.4**.

This dimension reflects temporal considerations in terms of its relative emphasis on effectiveness versus efficiency in relation to competitive futures and potential changes in firm's competitive landscape. It has to do with understanding patterns, forms and degrees of potential change in the competitive market (Courtney et al., 1997). The empirical findings show that the *Futurity* dimension is reflected by four items, consisting of three added items and one original item. Because *Futurity* is

originally a reflective scale, the addition and replacement of individual items is not an immediate problem. Being embedded in a competitive and collaborative environment, the *Futurity* dimension represents the balance between current and future needs, as reflected by having a balance between maintaining strong, long-lasting relationships and developing the new ones, considering the future needs of the partners in creating visions and balancing a firm's interests and those of its partners. In doing so, firms often conduct "what-if" analyses of critical issues. As firms are increasingly connected, creating a vision largely depends on shaping the interest of their partners and, thus, on balancing their own interests and those of their partners. As common interests are shared among members of the network, firms, together with their network partners, can partly shape what the future will look like and, thus, gain a stronger position than their competitors.

Table 5.16. Statistical results of testing the four-Indicators model of the *Futurity* dimension

Items		***ML Estimate***	***t-value***	***p-level***
FUTURITY				
We emphasize the importance of maintaining balance between strong and long-standing relationships with creating new ones	FUT1	0.72	5.71	****
When developing our future in the network, we consider the future needs of our partners	FUT3	0.85	7.39	****
We balance the needs of our organization with the needs of our partners	FUT4	0.94	8.38	****
We often conduct "what-if" analyses of critical issues	FUT7	0.61	4.65	****
	χ^2	2.28	ns is not significant, * p<0.10 **p<0,05 ***p<0.01, ****p<0.001	
	Df	2		
	p-value	0.32		
	RSMEA	0.052		

The empirical work supports our initial expectation in that the original items and the proposed extension converge into one dimension. The original set and the additional items reflect the same underlying concept of organizational preparedness for long-term threats (Morgan & Strong, 2003). Both sets reflect firm's action to understand the pattern, form, and extent of potential change in competitive, industry, market and allied business (Courtney et al., 1997). In addition to that, differences in the characteristics between both environments seem to have no influence on the firm's *Futurity* trait.

5.8.3. Pro-activeness

Pro-activeness involves a firm's orientation towards participating in new markets, its continuous search for market opportunities and responses to changing

environmental trends (Venkatraman, 1989). We proposed that this model is represented by 12 items, consisting of 4 original and 8 network-related items. The initial model did not provide a reasonable model fit (p=0.00; X^2 = 112.38; df=54), which is why we tried to refine the model, which yielded a single-dimension 5 item model, as shown in **Figure 5.5**. The model fit is good, as indicated by significance level p=0.27 (X^2 = 6.38; df=5), which is above the generally accepted (>0.05) or conservative level (> 0.10), as shown in **Table 5.17**. Furthermore, the ML estimates and t-values for the items indicate that this model gains empirical support.

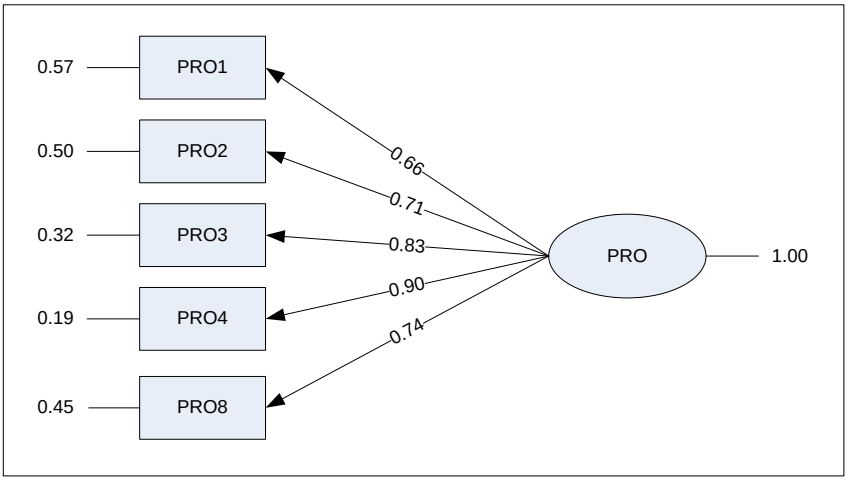

Figure 5.5. Refined model for *Pro-activeness* dimension

The empirical findings show that the *Pro-activeness* dimension is reflected by five items, all of which were newly added. They reflect a firm's proactive actions in response to continued threats in its external environment by proactively shaping and creating new business opportunities, or pursuing new opportunities in emerging product markets. *Pro-activeness* is about having access to knowledge about future demands and new developments/advances, both inside and outside the firm's current domain, so that it can take advantage of the information to which it has access to maintain and enhance its competitive advantage (Hoffmann, 2007). Shaping and creating new business opportunities is reflected in reconfiguring and combining different competencies, and providing opportunities to other firms to leverage, build on and extend each other's products or competences.

Table 5.17. Statistical results of testing the five-indicators model of the *Pro-activeness* dimension

Items		*ML Estimate*	*t-value*	*p-level*
PRO-ACTIVENESS				
We often take initiatives to create strategic relations with prominent client/leaders in ***different*** domains	PRO1	0.66	5.05	****
We establish a framework of co-evolution that brings together the competencies of many firms that helps our network to develop	PRO2	0.71	5.57	****
We create the possibilities of other firms leveraging, building on, or extending our products	PRO3	0.83	6.98	****
We foster knowledge transfer among our business partners when needed	PRO4	0.90	7.95	****
We actively monitor our environment to identify valuable partners	PRO8	0.74	5.95	****
	χ^2	6.38	ns is not significant, * p<0.10 **p<0,05 ***p<0.01, ****>0.001	
	Df	5		
	p-value	0.27		
	RSMEA	0.074		

The *Pro-activeness* dimension refers to a firm's orientation to look for new opportunities: forward-looking, first mover-advantage seeking efforts to shape the environment by introducing new products and processes ahead of the competition (Lumpkin & Dess, 1996). It refers to a focus on finding new opportunities by identifying unmet needs, fragmented and underutilized resources, and inventing new value chains that bring resources and needs together in a creative way. These kinds of orientation need the allocation and structuring of both internal and external resources. In this sense, the original and additional items converge into one dimension, as expected and supported by the result of our confirmatory factor analysis.

5.8.4. Defensiveness

The *Defensiveness* dimension represents a firm's focus on searching for efficiency. We proposed 11 items to measure firm's *Defensiveness* orientation, four from the original items and seven from the additional network-related items. The estimation of the initial model yielded a significance level of p=0.00 (X^2=124.69; df=44, which indicates that this model does fit. We therefore hypothesized a revised model, as shown in **Figure 5.6,** with two-interrelated dimensions. Since it showed to provide a better fit than the initial model, we further explored and iteratively improved this alternative model by deleting items with low loadings and high absolute standardized residuals.

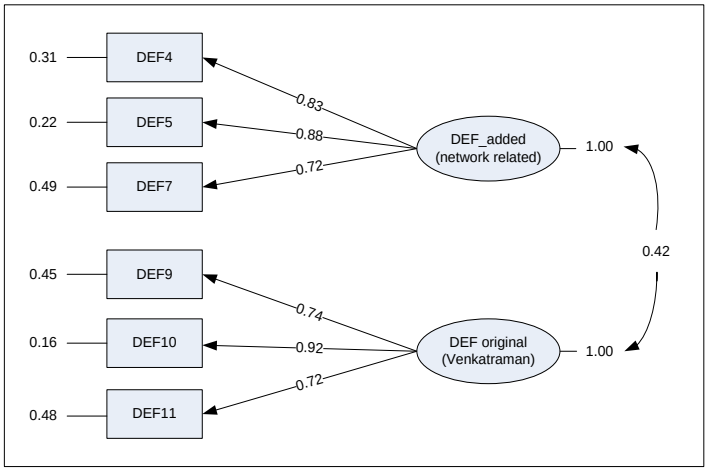

Figure 5.6. Refined model for *Defensiveness* dimension

As a result of these iterations, we arrived at a six-item model with all items showing significant t-values, as shown in **Table 5.18**. Although the model shows a reasonable fit (X^2 = 4.54; df=9) and acceptable parameter estimates, we should be careful with regard to the conclusion based on the normed chi-square value. The normed chi-square is 2.098, which is above the acceptance range, indicating that this model needs improvement. Therefore, we conclude that our model of *Defensiveness* has no empirical support.

The empirical results show that three of the original items converge into one dimension and one of them had to be deleted due to low loading. Again, as the original scale is reflective, this does not pose an immediate problem. Four items from the added (network-related) items were deleted, stating a strong alignment with the strategies of a firm's partners, maintaining strong and long-lasting partnerships, encouraging informal employee interactions, and exploiting current resources for existing needs. There are three items that have strong loadings and internal consistency, indicating convergence into one dimension. They reflect a firm's defensive trait of having efficiency seeking focus by having efficient knowledge flow, increasing productivity in a firm's network and increasing asset's value through better adaptation with partners. This efficiency focus in a firm's attempt to access and utilize external resources is related to maintaining resource mobility, which is defined as the ease and efficiency with which resources are shared, acquired and deployed within the firm and its network (Dhanaraj & Parkhe, 2006).

Table 5.18. Statistical results of testing the seven-Indicators model of the *Defensiveness* dimension

Items		*ML Estimate*	*t-value*	*p-level*
DEFENSIVENESS				
We increase productivity by forging/making connection between network partners	DEF4	0.83	6.76	****
We constantly adapt our own specific assets in order to increase the value of the assets provided by our partners	DEF5	0.88	7.33	****
We enable efficient knowledge flows by using robust knowledge sharing processes	DEF7	0.72	5.58	****
We often emphasize product/services quality through the use of quality circles	DEF11	0.74	5.71	****
We often use production (of goods or services) management techniques	DEF12	0.92	7.47	****
We often emphasize product (of goods or services) quality through the use of quality circles	DEF13	0.72	5.56	****
	χ^2	16.64	ns is not significant, * p<0.10 **p<0,05 ***p<0.01, ****>0.001,	
	Df	8		
	p-value	0.034		
	RSMEA	0.145		

Defensive behaviour reflects the extent to which a firm employs cost reduction and efficiency-seeking methods (Venkatraman, 1989). It focuses on prominence within its existing domain by exploiting existing internal and external resources. While we previously stated that a firm's traits when it comes to realizing efficiency will be similar for both internal and external resources, the empirical results indicate that they may be different. We checked for discriminant validity by comparing the AVE estimates of each dimension with the squared inter construct correlations associated with that dimension (Hair et al., 2006). We found that the squared inter-construct correlation (r^2=0.16) is lower than the AVE (AVE_{added}=0.66 and $AVE_{original}$=0.64). Thus, the argument that the two dimensions seem to be distinct from each other is supported.

There may be differences due to differences in the domain of efficiency-seeking methods and objects. Internal defensiveness is related to the organizational domain and external defensiveness to the network domain. Efficiency-seeking activities in the organizational domain involve excelling in production and cost control and employing robust management and production techniques (Morgan & Strong, 2003). Defensive behaviour related to the network domain involves ensuring resource mobility with which resources are shared, acquired and deployed among members of the network (Dhanaraj & Parkhe, 2006).

Firms use and maintain strong and long-lasting relationships with their partners to ensure mobility (Hoffmann, 2007). Firms encourage the continuity of these relationships with partners around their technological platform or subsequent production activities in order to ease integration and interoperability (Iansiti & Levien, 2004). This improves the productivity of the network, and subsequently, of the firms themselves. Although those two domains both represent efficiency-seeking behaviour, the direction may be somewhat different, due to the different characteristics of the two environments. The initial set of items is highly related to competition at an individual level, while the extension is related to network-level competition. However, this path still needs to be further investigated to obtain a good model of *Defensiveness*.

5.8.5. Analysis

The *Analysis* dimension was initially proposed as consisting six items from the original set and seven additional network-related items. Similar to the *Aggressiveness* model, the estimation of the initial model showed a bad model fit ($p=0.00$; $X^2 = 139.80$; $df=65$), which means that the proposed model needed to be modified. Based on the loadings parameters and the correlation matrix, we hypothesized a revised model. We suggest that a model in which the items converge into two inter-related dimensions, one dimension related to internal organization domain and the other to the external organizational domain would provide a better fit. We used this new model and made iterations of model refinement by deleting items with the lowest loadings and highest absolute standardized residuals (Hair et al., 2006). This resulted in a model composed of four items for the network-related dimension and three items for the internal-related dimension, as shown in **Figure 5.7**. The statistical significance level of $p=0.28$ ($X^2 = 15.44$; $df=13$) is above the conventional level, which indicates a good model fit.

As shown in **Table 5.19**, all parameter estimates are statistically significant at $p<0.001$. Although the revised model gave better fit, it still needed to be improved, especially because one dimension was composed of only three items, which is the minimum number of items to establish content validity (Hair et al., 2006). The empirical results show that the original items converged in the same dimension. However, three of the original items showed low loadings and were deleted, i.e., items stating emphasis on effective coordination, on factual information supporting decision-making processes, and on the tendency to be highly analytical. Since the original scale is reflective, this does not pose an immediate problem. As for the additional items, here, too, three items were deleted for low loadings, as they were not internally consistent with the other items, i.e., items stating designing processes and resource pool, conducting

periodic reviews of the network, and critically and openly reviewing network benefits.

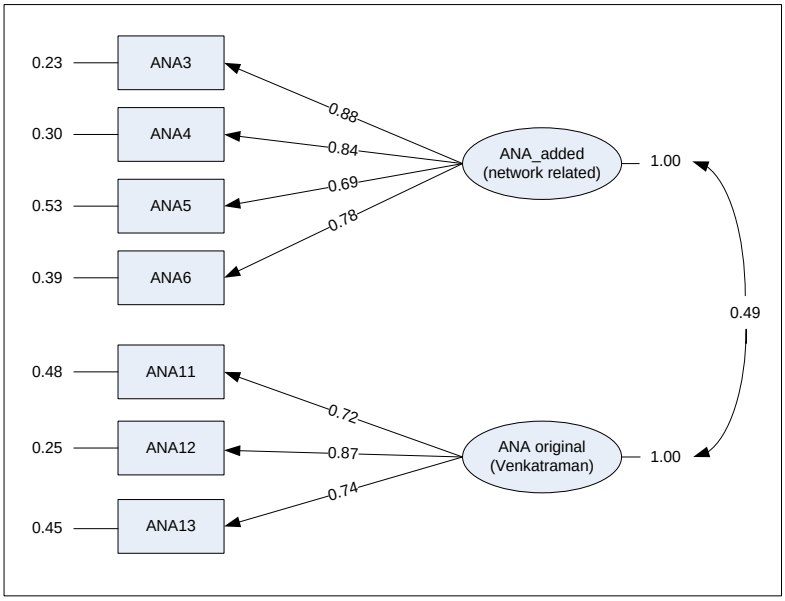

Figure 5.7. Refined model of *Analysis* dimension

The empirical results also show that the *Analysis* dimension reflects the tendency of a firm to look deeper for the roots of problems and to generate the best possible alternative solutions (Venkatraman, 1989). This, in turn, reflects a firm's knowledge capacity building (Bourgeois, 1980) and organizational learning (Cohen & Sproull, 1996). Good quality and reliable information comes from a firm's routines and activities, using both its internal and external resources. The network-related items reflect a firm's analytical traits in a business network, stating a thorough analysis on the benefits of a firm's partnerships, information acquisition and sharing with partners, and a thorough assessment of the valuable knowledge arising from such partnerships. Those items reflect the analytical trait that enables firm to gain a deeper understanding of their partners' resources and to integrate them with their own internal resources.

The items in *Analysis* do not converge into one dimension, unlike what we expected. These items go into two dimensions. We checked for discriminant validity by comparing the AVE estimates of each dimension with the squared inter-construct correlations associated with the dimension in question (Hair et al., 2006). From the analysis, we found that the squared inter-construct correlations

(r^2=0.24) is lower than the AVE (AVE_{added}=0.60 and $AVE_{original}$=0.65. This supports the argument that the two dimensions seem to be distinct from each other.

Table 5.19. Statistical results of testing the seven-indicators model of the *Analysis* dimension

Items		*ML Estimate*	*t-value*	*p-level*
ANALYSIS				
We periodically examine our existing business positions and investigate the potential of new partnerships	ANA3	0.88	7.61	****
We thoroughly check the benefits from our partnerships before integrating them into our internal operation	ANA4	0.84	7.07	****
We collect and share information that provides a context for other members in our network	ANA5	0.69	5.35	****
We thoroughly assess the value of relevant knowledge that enters our company before we take action upon it	ANA6	0.78	6.36	****
We use several planning techniques	ANA11	0.72	5.45	****
We use the outputs of management information and control systems	ANA12	0.87	6.85	****
We commonly use manpower planning and performance appraisal of senior managers	ANA13	0.74	5.63	****
	χ^2	15.44	ns is not significant, * p<0.10 **p<0,05 ***p<0.01, ****>0.001,	
	Df	13		
	p-value	0.28		
	RSMEA	0.061		

We argue that this could be caused by differences in the locus of information (internal or external) and the knowledge that needs to be analyzed. Internal analysis captures a firm's focus on obtaining consistent and good information, which can be only done by emphasizing coordination among different functional areas and the use of knowledge management systems to support decision-making processes (Venkatraman, 1989). External analysis captures a firm's focus on gaining access to good and reliable information outside its boundaries. Consequently, we can expect that each set of items will still correlate, although they will load into two different dimensions.

5.8.6. Aggressiveness

We initially suggested that the *Aggressiveness* dimension was captured by four items from the original strategic orientation set and an additional five items from the network-related orientation set. The proposed measurement model provided poor model fit (X^2=16.97; df=9; p=0.049), and several items yielded negative loadings, which indicates that convergent validity was not achieved (Hair et al.,

2006). It means that the one-dimensional model of *Aggressiveness* should be rejected, since this set of items seems to diverge into two different dimensions.

We then hypothesized an alternative model with two dimensions, one of which focuses on traits related to threats in the competitive environment and the other one on traits related to threats in the collaborative environment. We also removed one item (AGR2), because it showed very low loading to the intended dimensions. The revised model (see **in Figure 5.8**) provides a better model fit. The likelihood ratio chi-square (X^2=24.48; df=19) has a statistical significance p=0.17, which is above the minimum and conservative level of 0.05. Furthermore, the measure of root mean square error of approximation (RMSEA) is below 0.08, indicating a fair model fit (Hair et al., 2006).

As shown in **Figure 5.8.** and **Table 5.20**., all items show acceptable loadings, except for AGR 3 and AGR4, which indicates that those two items show a lack of correspondence between the theoretical construct and the empirical observations. However, if we exclude these two items, the model is overfitted. Given of small sample size and number of parameters and given that the parameter estimates of AGR3 and AGR4 are just below the minimum acceptance level 0.30, and the t-values are on the border of significant at p-level less than 0.10, we decided to keep these two items to ensure having the minimum number of items in each dimension, which is useful for future replication and validation purposes (Hair et al., 2006).

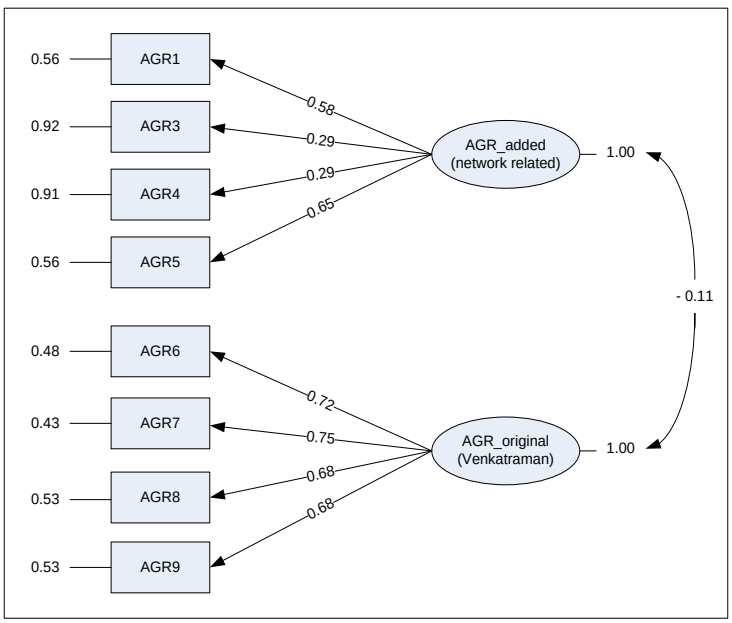

Figure 5.8. Refined model for *Aggressiveness* dimension

This empirical result shows that two added (network-related) items significantly converge into one dimension, while the other two have no convergence. This indicates that the two items reflect a firm's key strategic trait in acquiring market positions or resources faster than competitors sometimes. Dedicating whatever resources needed, dissolving long-term partnerships, showing opportunistic behaviour or focusing on short-term gains over long-term gains or vice versa, reflect a firm's aggressive traits in a business network. The two items about blocking competitors and sanctioning partners have a low degree of correspondence with the construct. One item stating a firm's focus on strong bargaining power did not converge into this *Aggressiveness* trait.

Table 5.20. Statistical results of testing the eight-Indicators model of the *Aggressiveness* dimension

Items		*ML Estimate*	*t-value*	*p-level*
AGGRESSIVENESS				
We are willing to abandon existing long term relationships when they are no longer relevant	AGR1	0.58	2.58	***
We often block other companies' attempts to copy our contributions and/or their attempts to oppose us in a way that may render our contributions in the network less valuable	AGR3	0.29	1.62	Ns
We are willing to dedicate whatever people and resources are necessary to ensure that our approach will become the dominant market standard	AGR4	0.29	1.65	*
We sanction opportunistic behaviour (cheating or leaking information to competitors) in our networks	AGR5	0.65	2.81	***
We often sacrifice profitability to gain market share	AGR6	0.72	5.43	****
We often cut prices to increase market share	AGR7	0.75	5.75	****
We often set prices below competition	AGR8	0.68	5.07	****
We often seek market share position at the expense of cash flow and profitability	AGR9	0.68	5.08	****
	χ^2	24.48	ns is not significant, * p<0.10 **p<0,05 ***p<0.01, ****>0.001,	
	Df	19		
	p-value	0.17850		
	RSMEA	0.074		

The *Aggressiveness* model shows a better model fit with two dimensions than the one dimension model. We checked for discriminant validity, by comparing the AVE estimates of each dimension with the squared inter-construct correlations associated with that dimension (Hair et al., 2006). We found that the squared inter-construct correlations (r^2=0.01) is lower than the AVE (AVE_{added}=0.46 and

$AVE_{original}$=0.42, which means that it seems that the two dimensions are distinct from each other and may suggest trade-off between them.

This discriminant validity may indicate that a firm's aggressive traits are different when a firm deploys its internal and external resources or responds to its competitive and collaborative environment. The *Aggressiveness* dimension represents a firm's combative trait designed to improve its market position and resource accumulation at a relatively faster rate than its competitors in its chosen market(s) (Clark & Montgomery, 1998; Venkatraman, 1989). It reflects a firm's behaviour toward its competitors and the way it responds to trends and demands that already exist in the marketplace (Dess et al., 1997). The original set of items represents the structuring and allocation of internal resources, i.e., financial position and product price, to respond to threats in the firm's competitive environment.

Additional items, which are expected to capture a firm's orientation in responding to threats that emerge in its external environment using external resources, do not go into the same direction as the original items, as is also shown by the correlation between the two dimensions. Although the intention is similar, the use of different types of resources creates different patterns of actions. Since a firm's external resources, to some extent, are not under its complete control, it will have difficulties engaging in similar actions compared to firms using their internal resources. Being dependent on other partners or being bounded by contracts, a firm cannot sacrifice its external resources or short-term gain as easily as it can with its internal resources. Sacrificing external resources (in terms of dissolving long-term relationships or dedicating whatever resources are needed) is different from sacrificing profits. Sacrificing profits is, to some extent, under a firm's complete control, which is not the case with relationships. In addition, long-term relationships entail formal and informal agreements between firms, which are also manifest in a firm's dependency to its partners and its product relatedness. Sacrificing external resources has a systematic effect on a firm's own product markets and those of its partners. It may hurt the interests of other partners connected to the firm or the dissolved firms, which later may hurt the interest of the firm itself. Therefore, achieving long-term gains by sacrificing short-term gains in relation to network resources touches upon the shared interest of the members of the firm's business network. Sacrificing external resources involves a high risk that may endanger the firm's interests rather than successfully bringing long-term gains or market positions. In this way, a firm's aggressive behaviour should ensure that achieving long-term gains and sacrificing short-term gains does not hurt the interests of the partners in its business network. This is different from using internal resources or an internal orientation,

where everything is under a firm's control and achieving long-term gains does not necessarily affect the interests of other members of its business network.

Although the orientation of acquiring long-term gains by sacrificing short-term gains is similar for both, i.e., achieving market position faster than the competition, the deployment or structuring of internal resources is different from that of external resources. Similarly, internal-oriented actions are different from external-oriented actions. This could explain why the two-dimension model potentially captures these two patterns of strategic actions better. The two types of resources apparently require different responses.

5.8.7. Riskiness

We initially hypothesized that *Riskiness* is represented by six items, consisting of four original items and two network-related items. Estimation of the initial model indicates low model fit (p=0.040; X^2=25.81; df=9). Furthermore, similar to the aggressiveness dimension, the estimates of the initial model indicated that these six items may load on two dimensions, a conventional strategic orientation dimension and a network-related orientation dimension. However, since we only provided two network-related items, we were unable to test this alternative model (Hair et al., 2006). We therefore continued refining the initial model by removing problematic items, i.e., the new added network-related items. This refinement yielded a revised, 4-item, single-dimension model, providing reasonable empirical support, as shown in **Figure 5.9**. As summarized in **Table 5.21**, the ML estimates are statistically significant and the fit estimates show a reasonable fit.

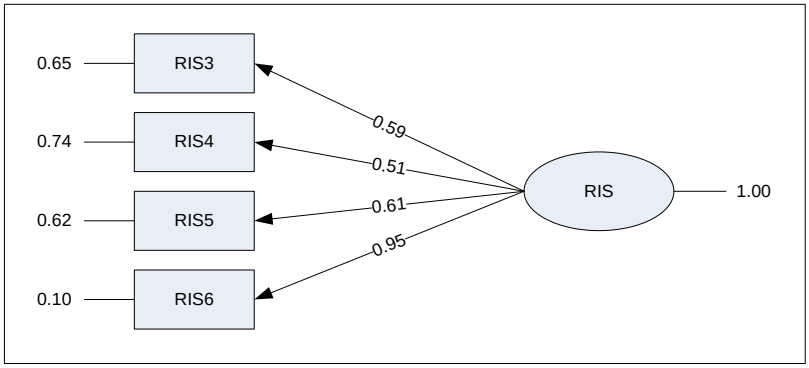

Figure 5.9. Refined model for *Riskiness* dimension

The four original items converge into one dimension, as we expected. As shown by the three indicators of convergent validity (i.e., Cronbach α, construct reliability and variance extracted), the four indicators model show convergence. The

Riskiness dimension consists of four items representing the degree of risks in various resource allocation decisions, as well as in the choice of products and markets (Venkatraman, 1989). However, we have to be careful in interpreting the result since it may also possible that this dimension converges into two different dimensions, as previously found with *Aggressiveness*, *Analysis* and *Defensiveness*.

Table 5.21. Statistical results of testing the four-indicators model of the *Riskiness* dimension

Items		*ML Estimate*	*t-value*	*p-level*
RISKINESS				
In general, our mode of operations is riskier than that of our competitors'	RIS3	0.59	4.23	****
We adopt a (rather) conservative view when making major decisions	RIS4	0.51	3.52	****
Our business operations generally follow 'tried and true' paths	RIS5	0.61	4.40	****
We tend to be risk-averse	RIS6	0.95	7.00	****
	χ^2	2.61	ns is not significant, * p<0.10 **p<0,05 ***p<0.01, ****<0.001,	
	Df	2		
	p-value	0.27		
	RSMEA	0.077		

5.9. Concluding Remarks

5.9.1. Conclusions

The primary aim of this chapter has been to answer "how can firm strategic actions in a business network be measured?" (Q-4). We developed and validated a measurement instrument of the strategy construct that is relevant in a situation where a firm is engaged in a competitive as well as a collaborative environment (Boyd et al., 2011). We used a comparative approach to develop a measure of firm strategy, which enabled us to capture relative emphasis over a firm's key strategic traits.

Strategic actions are considered an important factor interacting with a firm's resources, explaining differences in firm performance within business networks. We built on the STROBE construct, which measures a firm's strategic actions. We argue that, to increase the relevance and precision of the STROBE instrument, we need to add the business network context. In doing so, we conceptualized and tested an extension of the STROBE construct with network-related strategic orientation items. We extended each dimension of STROBE with items related to a firm's use of external resources and orientation toward the collaborative environment. In doing so, we developed a valid instrument to measure firm

strategy that involves managing both the competitive and collaborative environments. Having a valid strategy construct will allow us to measure the relative emphasis a firm puts on the strategic orientation dimensions in its collaborative and competitive environments. It will also allow is to empirically investigate whether a firm will perform better if it shows a range of strategic orientations that balance the tensions within its competitive and collaborative environments.

We designed this study into three stages: (1) item generation, (2) a pre-test of substantive validity, and (3) a survey, to enhance the requisite level of validity and reliability of our proposed strategy construct. Based on the results of the different stages, we conclude that the extension of the current strategic orientation of business enterprise with network-related items is a necessary and valuable one. From the literature review and the interviews, we conclude that different strategic traits are needed for a firm to manage the opportunities and threats that emerge from having a bundle of relationships with its partners. These traits need to be included in the multi-item measurement of the strategy construct, as we want to explain the variance of firm performance in a business network. The empirical analysis of substantive validity provided us with a reasonable support for our expectations, i.e., the one-dimensional models for each trait. The assessment of substantive validity provided us with a good indication of construct validity. Items with a high (negative or positive) substantive validity were also retained in the subsequent analysis.

The survey and its related confirmatory factor analysis showed that the original items are consistent, but not all the additional items, i.e. network-related items, show the same level of consistency. Unlike what we expected, the network-related items do not always converge in the same dimensions as the original items. Three dimensions (*Pro-activeness*, *Futurity* and *Riskiness*) support our initial expectation, while three other dimensions (*Aggressiveness*, *Defensiveness* and *Analysis*) do not support our initial expectation, as shown in **Table 5.22**.

The dimensions *Pro-activeness* and *Futurity* received valid empirical support and met our initial expectations of a one-dimensional model. The *Riskiness* dimension meets our prior expectation, as shown by its model fit and convergent validity. Unfortunately, we were unable to test potential model improvement, due to the limited number of network-related orientation items. As for the other three dimensions, we tested for alternative models assuming a firm's strategy using its external resources and showing different strategic traits. These models, with two different dimensions, provide a better fit for *Aggressiveness*, *Analysis* and *Defensiveness* dimension. The *Aggressiveness* dimension has no convergent validity. The *Defensiveness* dimension shows poor model fit. Further tests are

needed involving a larger sample to enable generalization. From the discriminant analysis, we can conclude that firms show different pattern of strategic actions between using their internal and their external resources in the *Aggressiveness, Analysis* and *Defensiveness* dimensions.

Table 5.22. Summary of the findings of Chapter 5

No.	Dimensions	Model Fit	Convergent Validity	Number of Dimensions
1.	*Futurity*	+	+	1 dimension
2.	*Pro-activeness*	+	+	1 dimension
3.	*Defensiveness*	-	+	2 dimensions (original and added)
4.	*Analysis*	+	+	2 dimensions (original and added)
5.	*Aggressiveness*	+	+/-	2 dimensions (original and added)
6.	*Riskiness*	+	+/-	1 dimension

This instrument covers dimensions that reflect both efficiency-seeking and entrepreneurial traits. The two types of strategic traits are necessary in ensuring resources as a source of competitive advantage, as suggested by Barney and Arikan (2001). These traits are needed to enhance and protect the VRIN conditions of a firm's resources. *Analysis, Defensiveness, Aggressiveness* and *Riskiness* are important to protect the VRIN conditions of a firm's resources as a source of competitive advantage. *Futurity* and *Pro-activeness* are considered important to build a firm's innovative capabilities and are also considered important entrepreneurial traits, which are necessary for firms to enhance the VRIN conditions of their resources. *Pro-activeness*, *Futurity* and *Riskiness* are mostly outward looking, which means that the network-related items converge into the same dimensions as the original items. The network-related items in the *Aggressiveness* dimension reflect a firm's autonomy in imposing its own agenda/interests. By contrast, the original items reflect a firm's efficiency-seeking trait designed to achieve a better market position than its competitors.

5.9.2. Limitations and further research

The main limitation in this Chapter is the small size of the sample, which prevents us from simultaneously testing the proposed instruments. Further tests need to be done with a larger sample. It is important to gather additional data to test various models, to ensure the validity of the extended STROBE construct. In addition, refinement of the current set of items, follow-up investigations examining discriminant validity, nomological and face validity can increase the

validity of the extended STROBE construct. This requires expanding the number of cases. However, the results of the first steps in the development and testing of this construct are promising enough to warrant such further investigations, which must take into account the possibility of distinct network-related dimensions in *Aggressiveness, Defensiveness* and *Analysis*. Attention must also be given to the *Riskiness* dimension, as we were unable to test potential model improvement, due to the limited number of network-related orientation items.

6. Concluding Remarks

The aim of this study is to shed light on the role of internal and external resources and strategic actions in explaining variance in firm performance. This concluding chapter shows how the results of each part of this thesis contribute to the central research question, i.e. *What are the roles of internal and external resources, and strategic actions in business networks, and what is their relationship with firm performance?* We structure the present concluding chapter by presenting the key findings and theoretical implications of each chapter, after which we synthesize the findings, discuss the theoretical implications, and present directions for future research as well as management implications.

6.1. Key findings

6.1.1. Conceptual framework

The conceptual study in **Chapter 2** focuses on developing a conceptual framework as a basis for the empirical work in **Chapters 3**, **4**, and **5**. The RBV has contributed to strategic management literature by emphasizing resources as an important determinant of firm performance. It is based on the assumption that firms in an industry (or group) are heterogeneous when it comes to their resources. To conceptualize a firm's resources in a business network, we propose to complement the RBV with the network perspective, which provides a methodology and theoretical perspective to understand the source of a firm's competitive advantage that lies in the resources that its partners may possess and that are available to a focal firm through its connections with those firms.

Because a firm is not isolated from its external environment, the VRIN conditions of its resources are affected by the way the firm copes with opportunities and threats in its environment. Resources provide a potential to generate variance in firm performance. The realization of the full potential value of a firm's resources is also dependent on the firm's strategic actions, which strategic actions influence the magnitude and/or direction of the relationship between a firm's resources and its performance. Better firm performance is likely to be the joint result of a firm's internal and external resources, as well as the ability to strategically exploit and safeguard a competitive advantage. The RBV and the network perspective are relatively silent on the issue of strategic actions. In order to overcome this, the conceptual framework takes into account three important factors that influence firm performance: (1) a firm's internal resources, (2) a firm's external resources and (3) a firm's strategic actions. To this end, we build on previous work by Zaheer

and Bell (2005) and Lavie (2006), extending the RBV with external resources from the network, and by Venkatraman et al. (2008), and Koka and Prescott (2008) on strategic actions of firms that are operating in competitive as well as collaborative environments.

6.1.2. What are the firm resources and what is their relationship to firm performance?

The main focus in **Chapter 3** is on the firm's resources in a network and their relationship to firm performance. Deriving arguments from the RBV and the network perspective, we examined (1) *What are firm resources in a business network?* (**Q1**) and (2) *What is the relationship between a firm's resources in a business network and firm performance*? (**Q2**). Following the conceptual model, we investigated the firm's internal and external resources and operationalized them in the context of the software industry. We further investigated the relationships between these resources and firm performance. The findings suggest that, in an industry that is characterized by technology leadership, joint collaboration and competition, a firm's resources consist of internal and external resources. As represented in Table **6.1,** both internal and external resources explain variance in firm performance. Also, the inclusion of external resources increases the model fit, which indicates an increase of the explained variance in firm performance.

The relationship between a firm's resources and performance (**Q2**) is not straightforward. Confirming findings in previous research, internal resources, as reflected by technological and marketing assets, are not automatically clear and positive differentiators of firm performance. In our findings, technological assets negatively influence firm performance, while marketing assets show an inverted U-shaped relationship with firm performance and the interaction between marketing and technological assets is negative, implying that the relationship between marketing and technological assets is substitutive rather than complementary.

External resources, as represented by structural autonomy, directly influence firm performance and the relationship is positive, as expected. The interaction between centrality and structural autonomy does not significantly influence a firm's profitability. Structural autonomy benefits are linked with the industrial context. Since almost no software firm can on its own deliver all the technologies/products needed to satisfy customers, structural holes exist in this industry between firms in different product and market segments. Firms with structural autonomy, i.e., those that have access to these structural holes, are exposed to diverse technological advancements, business practices and/or market

information, which are important for their competitive advantage. This finding also suggests that having more resources does not necessarily improve firm performance. It seems that the use of external resources complements internal resources and provides firms with greater flexibility and adaptability, allowing them to exploit emerging opportunities in the software industry.

Table 6.1. Summary of findings of Chapter 3

Hypotheses	Profitability		
	No.	**Expected**	**Findings**
Firm size		Positive	*Positive and significant*
INTERNAL RESOURCES			
Technological assets	*H-1*	*Positive*	*Negative and significant*
Technological assets squared			*Negative and non significant*
Marketing assets	*H-2*	*Positive*	*Negative and significant*
Marketing assets squared			*Negative and significant*
Interaction of technological and marketing assets	*H-3*	*Positive*	*Negative and significant*
EXTERNAL RESOURCES			
Centrality	*H-4*	*Positive*	*Positive but non significant*
Structural autonomy	*H-5*	*Positive*	*Positive and significant*
Interaction of centrality and structural autonomy	*H-6*	*Positive*	*Negative and non significant*
INTERACTION			
Technological assets x Centrality	*H-7*	*Positive*	*Negative and non significant*
Technological assets x Structural autonomy	*H-8*	*Positive*	*Positive and significant*
Marketing assets x Centrality	*H-9*	*Positive*	*Negative and non significant*
Marketing assets x Structural autonomy	*H-10*	*Positive*	*Negative and non significant*

More importantly, this study suggests that the interaction between internal and external resources also influences firm performance. The higher variance explained by the model that includes external resources as independent variables, confirms this. This provides evidence of and extends the work by Zaheer and Bell (2005), which included external resources in explaining variance in firm performance. It also adds to research addressing this issue (Lee et al., 2001), by operationalizing a firm's position in terms of being connected to firms in different domains and their related benefits using a structural autonomy construct. The finding also confirms that there is a positive interaction between structural autonomy and technological assets, as found by Zaheer and Bell (2005) and Lee et al. (2001). Being structurally autonomous enhances the positive influence of a firm's technological assets on its profitability. This confirms the importance of a firm's network in providing complementary resources to its internal resources as

an important source of competitive advantage. While the interorganizational network perspective is relatively young compared to social networks, there is a growing body of knowledge explaining variance in firm performance from the structure or composition of the network. The conceptualization and measurement of external resources, as done in the interorganizational network perspective, enables us to examine the interaction between internal and external resources as a source of variance in firm performance. The results show that the findings from the interorganizational network perspective complement the findings from the RBV.

6.1.3. What are the various kinds of strategic actions within a business network?

The second empirical study, reported in **Chapter 4,** focuses on *What are the various kinds of strategic actions that firms can adopt in a business network?* (**Q3**). To answer the question, we developed and tested a conceptual framework of a firm's strategic action in a business network by means of case study research. In responding to competitors' threats, the RBV focuses on efficiency seeking in production and distribution. It also focuses on economizing rather than strategizing (Peteraf & Barney, 2003). Barney and Arikan (2001) mention the assumption embedded in the RBV that a firm's strategic actions in exploiting resources are considered obvious, which is a simplification of reality. To overcome these limitations, while still using the RBV to explain differences in firm performance, we need to carefully take into account factors that may hinder the realization of a firm's resources into a competitive advantage. Therefore, we conceptualized two roles of strategic actions as shown in **Figure 6.2**: enhancing and protecting the VRIN conditions of a firm's resources. Using these two roles and their respective dimensions helps us to track a firm's strategic actions in dealing with threats and opportunities in both its cooperative and collaborative environments. Since these two environments have different characteristics, these dimensions will help us to capture the difference emphasis firms use in their strategy.

The cross-case analysis of four software firms indicates that firms do differ in their strategic actions and that their strategic actions play a role in the relationship between their resources and performance. Clear differences were observed with regard to their actions to achieve technological leadership, develop a vision, manage efficiency and dependency, and respond to constant rivalry, though to a lesser extent when it comes to market leadership and risk management.

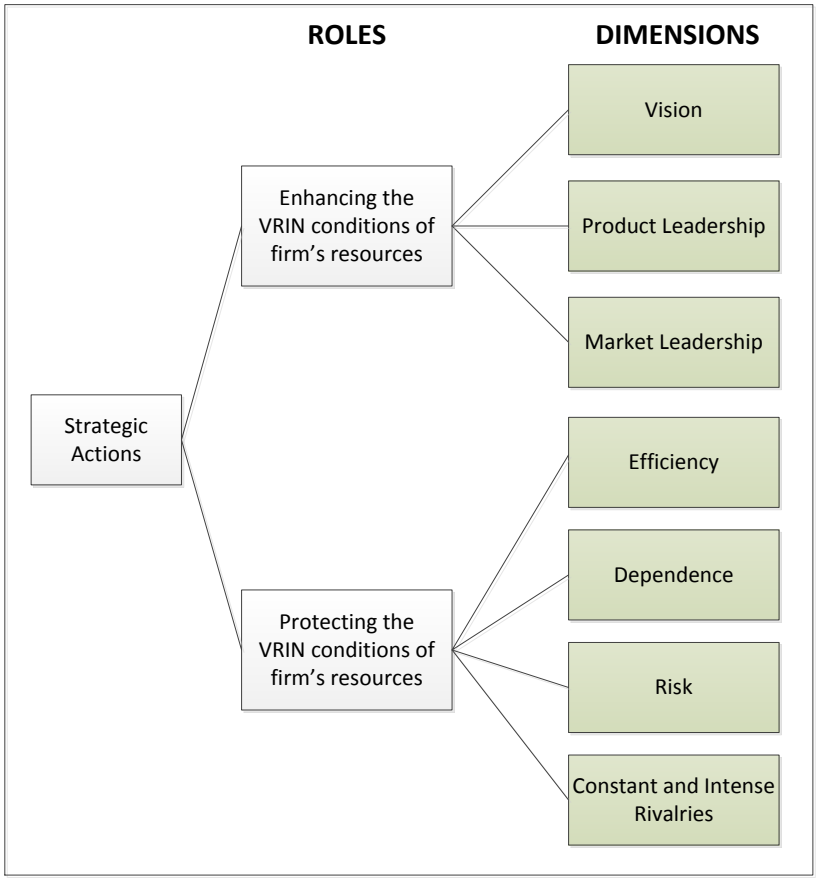

Figure 6.1. A framework of firm's strategic actions in a business network

Based on these findings as shown in **Table 6.2**, there are three main observations. First, history matters, as becomes clear from the differences in the stability of the trends of firms' past performance and internal resources, as well as the breadth of their product portfolio. These trends reflect firms' accumulated build-up of resources, signifying their competitive advantage. Second, strategic actions matter, as becomes clear from the differences of strategic actions between high performing and low performing firms. All firms show a variety of strategic actions across several dimensions. Variance in firm performance is thus influenced by the emphasis a firm puts on each dimension, which reflects the orientation or motivation of firms in achieving certain objectives. Third, we see that a firm's orientation towards its network matters. Firms that perform well capitalize on their internal and external resources, and strategically act on opportunities and challenges in their competitive as well as their collaborative environments. They co-innovate with their partners in the network, share their visions with their

ecosystems, and proactively provide policies and platforms to cooperate and facilitate learning. This means that firms devise strategic actions, not only in relation to their competitive environment, but also in relation to their collaborative environment.

Table 6.2. Summary findings of Chapter 4

No.	Dimensions	Higher Profitability
1.	firm performance over time	stability in trends over time
2.	firm attributes	
	• age	no difference
	• employee	no difference
	• revenue streams	no difference
	• product portfolio	differentiation in a focused market segment
3.	firm's resource configuration over time	stability in trends over time in their techological assets
4.	**firm's strategic actions: Enhancing the VRIN conditions**	
	• product leadership	proactively participating in cutting-edge technology with partners
	• market leadership	no difference
	• vision	proactively influencing the vision of future in its market segment by using short-term and long-term plan
	firm's strategic actions: Protecting the VRIN conditions	
	• efficiency focus	availability of a platform to learn from each other
	• managing dependency	clear and detailed policies on managing partnerships proactively ensuring integration and openness among their partners
	• managing risk	use both legal IP protection and other measures that enable openness, flexibility and interoperability
	• constant and intense rivalry	exerted aggressive actions in response to aggressive actions by its competitors

The findings from **Chapter 4** support the suggestion that strategic actions in a business network do matter. These actions are needed to handle instabilities and complexity in the network arrangement (Ireland et al., 2002), by managing dependencies, risks and uncertainties, and constant rivalries among firms, so that a firm can reap the benefits from cooperation. Most importantly, network strategies require a different course of action than competitive strategies in dealing with partners. A competitive strategy is developed based on the assumption that firms act in their own self-interest, which involves a control mechanism that is lacking in inter-firm relationships. When a firm interacts and develops relationships with other firms, its self-interest is tempered by its shared interests. While firms establish partnerships to fulfil their strategic interests, they need to find shared interests with their partners to make these partnerships work. Firms and their partners jointly set incentives and shared interests, and build trust

to make their partnerships mutually beneficial, making it possible to realize potential synergies between their resources, which satisfies both a firm's self-interest and that of its partners. Thus, strategic actions in a business network can be devised that allow firms, to some extent, to exert control or to monitor the resource transfer or interaction, i.e., to orchestrate the network (Dhanaraj & Parkhe, 2006).

To summarize, the strategic actions in a firm's business network are different from their competitive strategy, and need to be exercised simultaneously as a passive or active response to changes in the external environment, to complement the competitive strategy, and to underline a firm's active role in balancing the tension between threats and opportunities inherent in its competitive and collaborative environments (Kale & Singh, 2009; Pisano & Verganti, 2008). Moreover, we can conclude from the findings that internal and external resources are not sufficient to explain variance in firm performance, which also depends on a firm's strategic actions in response to their resources and external environment, confirming the proposition of (Barney & Arikan, 2001; Ray et al., 2004; Sirmon et al., 2007). To this end, we confirm the role of strategic actions in the relationship between a firm's resources and performance, complementing the RBV to provide a better understanding of variance in firm performance. It provides insight to further develop our knowledge on the need to take into account a firm's competitive context within the RBV (El Shafeey & Trott, 2014; Sanchez, 2008), to extend the boundary of a firm's playing field to include its relationships to collaborators and competitors that are understudied (Priem et al., 2013), to focus on proactive and deliberate actions in realizing potential of resources and opportunities in a firm's external environment (Madhok & Marques, 2004).

6.1.4. How can firm strategic actions in a business network be measured?

To answer the question "*How can firm strategic actions in a business network be measured?"* (Q-4), we conceptualized and tested a strategic orientation measurement tool in **Chapter 5**. The results of **Chapter 4** suggest that a firm's strategic actions in its collaborative and competitive environments affect its performance, which means that both environments should be acknowledged and the tension between them should be addressed. As the findings of **Chapter 4** suggest, firms that perform well engage in a wider range of strategic actions over dimensions of strategy than firms that perform less well. A strategic orientation construct should therefore measure the relative emphasis that firms put on key strategic dimensions in both types of environment. We address the challenge of developing and validating a measurement instrument of strategic orientation that is relevant in situations where firms are both engaged in competitive and

collaborative environments. The availability of measurement instrument is still an issue.

From the literature review and interviews, we conclude that firms act strategically in different dimensions of strategy, to manage threats and opportunities that emerge from the relationships they have with their partners. These actions reflect the active role firms play through concerted strategic actions to enhance and protect the competitive advantage inherent in their resources. These need to be included in the multi-item measurement of the strategy construct in order to explain the variance in firm performance in business networks. We propose an instrument that extends the six dimensions of a firm's strategic orientation (Venkatraman, 1989), as shown in **Figure 6.3**.

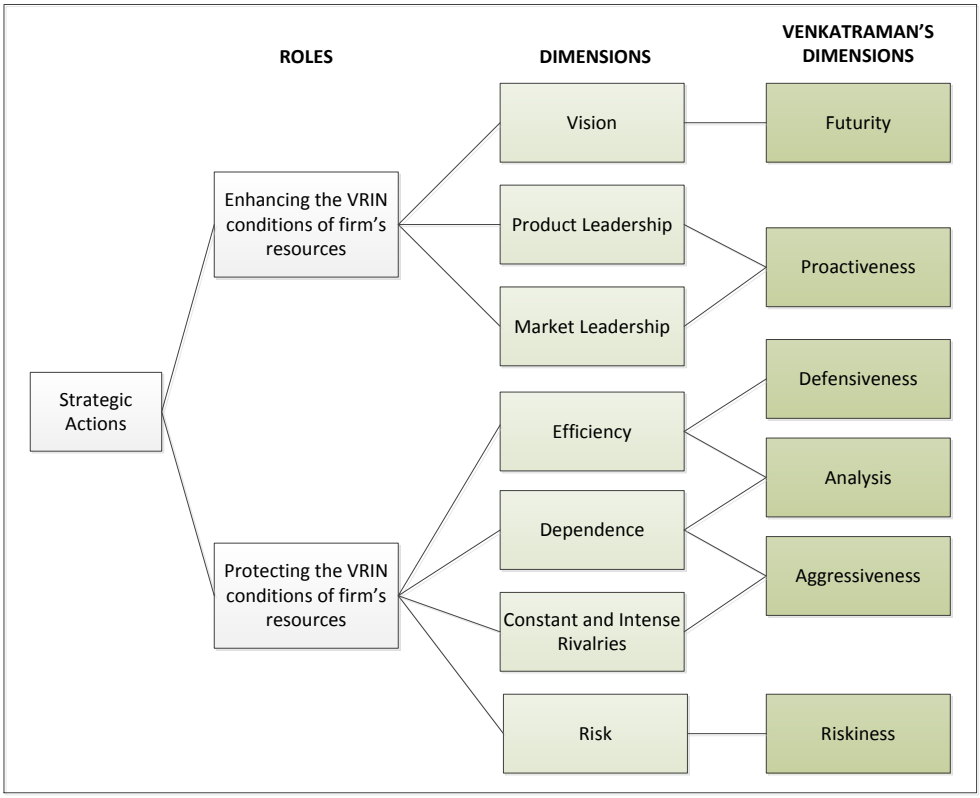

Figure 6.2. The relationship between the two roles of a firm's strategic action in its competitive and collaborative environments and the six dimensions of STROBE

the tension between the opposing forces from each type of environment. We argue that this finding is also in line with Venkatraman's (1989) dimensions. However, as he did not explicitly include external resources and the associated

strategic actions, we argue that the extended specification of the model will be more valuable in understanding a firm's strategic actions in a business network. In a business network, firms' strategic actions are dependent on their internal and external resources in order to obtain higher levels of firm performance.

Table 6.3. Summary of the findings of Chapter 5

No.	Dimensions	Model Fit	Convergent Validity	Number of Dimensions
1.	*Futurity*	+	+	1 dimension
2.	*Pro-activeness*	+	+	1 dimension
3.	*Defensiveness*	-	+	2 dimensions (original and added)
4.	*Analysis*	+	+	2 dimensions (original and added)
5.	*Aggressiveness*	+	+/-	2 dimensions (original and added)
6.	*Riskiness*	+	+/-	1 dimension

The findings of this chapter indicate that strategic actions do take place in business networks, as shown by distinct dimension of new items reflecting the firm's orientation toward its partners, in terms of managing efficiency, dependence, and tension in collaboration and competition. These types of actions do play a role in compensating the costs of being embedded in partnerships (Ireland et al., 2002). These findings, and those of **Chapter 4**, indicate the need for an active view of the RBV, as suggested by Barney & Arikan (2001).

6.2. Firm resources, strategic actions, and performance: Contributions of our study

Our first contribution is to explicitly define and include external resources for the explanation of firm performance. In the conceptual framework we argue that resources are also available in a firm's collaborative environment, i.e., its business network. We introduced the network perspective to complements the RBV in explaining sources of a firm's competitive advantage which are both internally inherent within a firm and externally available in other firms. The inclusion of these external resources is hardly investigated until the emergence of network perspective (Lavie, 2004, 2006; Zaheer & Bell, 2005). The findings show that the inclusion of a firm's external resources increases the model fit, thus, increases the explained variance in firm performance. The interaction between internal and external resources influences firm performance positively. It confirms the findings found in different research context, i.e. financial industry by Zaheer and Bell (2005) and start-ups as found by Lee, et al. (2001).

Our second contribution is explicitly including the role of a firm's strategic actions. The findings of **Chapter 3** suggest that the relationship between resources and firm performance is not a straightforward one. The mixed findings could lead to wrong conclusions. Discussions or arguments explaining the mixed findings from various studies are related to the firm's success or failure in exploiting the valuable, rare, inimitable and non trade-able resources. It means that the search for further explanations can only be done by opening the black box, i.e., the value creation of resources that causes a firm's resources to create a competitive advantage. Opening this black box requires us to consider a firm's strategic actions in creating and safeguarding the competitive advantage of its resources. The findings of **Chapter 4** suggest that firms that perform well place a different emphasis on their strategic actions on different strategy dimensions, compared to firms performing less well. Although the empirical evidence is limited to the four cases we examine, it gives us an indication as to the role of strategic actions in the relationship between a firm's resources and performance.

The RBV in its conventional form assumes that the effects of a firm's resources are immune to the dynamics in its external environment. In other words, the RBV focuses mostly on the intermediate term, and not on the long term, so that efficiency-seeking behaviour will overcome the risk of reduced competitive advantage. However, in a dynamic environment with short product and technology life cycles, such as the software industry, such efficiency seeking behaviour may not be enough to overcome the risks. Firms in such an environment need a more outward-looking view in their strategic actions to manage the dynamics in their external environment. We therefore argue that, for the software industry, strategic actions play an important role in the relationship between a firm's resources and performance, something that, to date, only a few studies have taken into account (Koka & Prescott, 2008; Ndofor, Sirmon, & He, 2011; Venkatraman et al., 2008). These strategic actions underline the need to augment the RBV with theories that explain the entrepreneurial approach in enhancing and protecting conditions necessary to improve firm performance. We open the black box of competitive advantage creation and improved firm performance by including strategic actions, particularly network-related strategic actions. This is an important contribution by this study, as it takes on the challenge by Barney and Arikan (2001, p.p. 188), who argue that "the link between resources and the strategies a firm should pursue will not be so obvious" and by Madhok and Marques (2014, p.p. 80), who argue "to shift from what a firm has to what a firm does with what it has, i.e. its actions".

The third contribution of this study is the creation and initial testing of a tool to measure strategic orientation that explicitly includes network-related strategy, meeting the challenge put forward by Boyd et al. (2011) to develop and validate a

new measure for strategy construct. We used a comparative approach that enables us to measure a firm's strategy based on the relative emphasis the firm places on certain strategy dimensions. Since the findings of **Chapter 4** show that network-related strategy matters, the tool needs to include and measure network-related strategy. This is supported by the findings of **Chapter 5**. Within the limitations of the study itself, we can conclude that there are different key strategic dimensions needed to respond to threats in the collaborative environment and that firms should acknowledge the tension emerging from the opposing characteristics of their collaborative and competitive environments. These key strategic dimensions are important to compensate the costs and tension that are the result of being embedded in partnerships.

To summarize, the conceptual model extends the RBV by including internal and external resources and adding strategic actions in enhancing and protecting the VRIN conditions of a firm's resources. Internal resources, external resources and strategic actions are all important in explaining firm performance. These findings allow us to complement the main causal mechanism of RBV, i.e., firm's resources as a source of competitive advantage, and strategic actions as a mechanism to enhance and safeguard that competitive advantage. We underline the importance of the match between a firm's resources and strategic actions in improving its performance.

6.3. Further research

Although the direct effects of resources and strategic actions on firm performance have been studied independently from each other, their combined effect has received less attention. Thus, testing resources and strategic actions, as proposed in the conceptual framework, will be an important challenge for further research. As suggested by Makadok (2011), to fully understand the variance in firm performance, i.e., profitability, a unified theory is needed that allows for interactions between different causal mechanisms. It is an interesting avenue of further empirical research to see how the causal mechanisms of RBV interact with each other and what the consequences are on increasing explained variance in firm profitability. The findings in this study provide a clear indication on the importance of the interaction between two causal mechanisms, i.e., (1) internal and external resources and (2) strategic actions, in terms of profitability. Further research can also look at how the alignment takes place or whether there are unique patterns of alignments that can be identified.

Before pursuing this challenge, however, several further investigations on each part of the research need to be done. First, there is a task in further exploring the simultaneous effects of different type of resources, especially between internal

and external resources. Second, the strategic orientation measurement tool needs to be further refined before going forward with testing the conceptual framework simultaneously.

Profitability and growth are two important indicators of firm performance (Steffens et al., 2009; Venkatraman & Ramanujam, 1986). Both measures reflect the ultimate economic goals of a firm, as stated in Barney's (1991) definition of competitive advantage and sustained competitive advantage. Profitability is a central measure of firm performance, which reflects a firm's goal in generating economic rents from its business activities (Amit & Schoemaker, 1993; Barney, 1991; Porter, 1980). It is likely to be an indication of the competitive advantage in a firm's resources, which reflects the firm's degree of efficiency and effectiveness in successfully transforming its resources into product market offerings with better economic value, which will likely translate into higher profitability compared to its competitors. Firm growth also represents the relative success in maintaining a competitive advantage, despite the duplication efforts of a firm's competitors. To do so, firms exploit increasing economies scale and scope (Chandler, 1990; Mishina et al., 2004). Increased size is also associated with visibility, prestige and the ability to withstand environmental shocks (Hannan & Freeman, 1984). These two types of firm performance, profitability and growth, help us examine the importance of a firm's resources in a detailed manner. Thus, further research must explore the firm performance construct and investigate the simultaneous effects of firm performance, as suggested by Steffens et al. (2009).

Because we focused on publicly listed firms only, there is a risk that important phenomena in the software industry or in its network structure cannot be captured. It would be intriguing to see how the smaller firms act in a network. As they presumably have lower accumulated technological and marketing resources than bigger firms, it will be interesting to see whether their strategic actions differ from those of big firms. How do these small firms perceive and act in their external environment? Do they need to rely on prominent firms to survive? How do they organically cooperate with larger firms to develop a network around themselves? We believe that smaller firms have their own roles that contribute to the development of rich networks that ensure the sustainability of the firms in the network. Since firms become more dependent on other firms for their existence, their performance also depends on that of others. Thus, in order to better understand variance in firm performance, a study on the relationship between the rich network, i.e. performance at the network level, and firm performance would be interesting.

6.4. Managerial implications

From a management point of view, the conceptual framework and the findings indicate the need to look beyond a firm's competitive and collaborative environment. The managerial implications that can be drawn from the findings of this study are: (1) internal and external resources and the interaction between those; (2) the interaction between resources and strategic actions; and (3) the role of balancing the collaboration and competition aspect of network-related strategy, are all important when it comes to improving better firm performance. This suggests that managers need to systematically look at their firm's resources and strategic orientation.

These findings can be summarized into three building blocks that may help managers to frame their strategy and translate that strategy into coherent strategic actions in an external environment that are simultaneously characterized by competition and collaboration: (1) knowing the resource positions, (2) aligning the resources and strategic actions, (3) evaluating the strategic actions firms can employ in a business network.

6.4.1. Knowing resource positions

Knowing the positions involves identifying a firm's current resource position to know the origin of the revenues. In identifying these resources, managers can ask the following questions:

- What are the positions of the firm's key internal resources relative to those of its competitors and collaborators?
- What are the positions of the firm's external resources relative to those of its competitors and collaborators?
- What is the right combination between internal and external resources?

The first managerial implication of this research has to do with the fact that internal and external resources are important for value creation and generate revenues. Internal resources provide firms with assets that are needed to create and leverage value. External resources provide complementary resources, in terms of information, control, etc., that are needed to leverage internal resources. The extent to which firms have access to external resources is highly dependent on their position in the network.

A dashboard scorecard, for example the one proposed by Iyer et al. (2006), will help managers to monitor and assess their position in their network relative to partners or competitors. This kind of dashboard maps a firm's' relationships with its partners, allowing managers to analyze their position relative to their partners over certain key metrics. Centrality and structural autonomy can be used as key

metrics representing external resources. These two positions are necessary for firms to capitalize on the two main benefits (quantity and quality) of their external resources. Similarly, a dashboard for internal resources, i.e., technological and marketing assets, can be developed. Knowing their position in their external environment, managers can then identify the benefits, costs and risks associated with value creation. Since a firm's external environment is highly dynamic (i.e. the structure of a network may change significantly due to the creation or dissolution of partnerships among firms or the introduction of breakthrough technologies), calibration of the dashboard might be done repeatedly (Iyer et al., 2006).

The next challenge for managers is to look for the interaction between internal and external resources, which involves the challenge of finding the right combination between internal and external resources. From a CEO survey by PriceWaterhouseCoopers (2008), technological assets and customer services are considered to be the main sources of a firm's competitive advantage. In this business network, firms continuously assess the complementarities between their own technological innovation and those of their partners (Lee, Venkatraman, & Tanriverdi, 2010a). Thus, they need to be able to map the complementarity between their resources and those of partners in terms of their technological innovation, as well as see the complex complementarity between technological innovation and customer orientation to bring value to the customers. The managers can then identify the benefits, costs and risks involved.

6.4.2. Aligning resources and strategic actions

Although resources are important, they are not sufficient to ensure improved performance. Resources by themselves do not create value, it is the interaction between resources and strategy that does. Strategic actions are needed to protect and enhance the competitive advantage of a firm's resources. The interaction between resources and strategic actions denotes the importance of knowing which roles a firm chooses to play in its external environment. Strategic actions ensure that resources are enhanced and protected, and that firms understand the larger context. Therefore, it is important for firms to align their resources with their strategic actions, which can only be achieved by knowing which external environment they choose to operate in and the opportunities and risk associated with it.

Firms can perform well by devising value-creating strategic actions that allow them to realize the full potential of their resources. Firms with a strong resource position relative to their collaborators and competitors will have greater flexibility in devising strategies to enhance and protect their competitive advantage. However, they also face pressure to choose between protecting and enhancing their resource positions. If they decide to pursue many strategic initiatives, their

overall strategy may become incoherent, which may have a negative impact on firm performance. The key is to check whether there are actions or initiatives that cover the dimensions of strategy. Using the framework in **Chapter 4**, managers could start identifying the potential strategic initiatives in their company, on the following dimensions:

- **What is the vision or what does the future look like in my current business network?** What are current key initiatives to ensure vision is shared in your internal organization and partners? Vision is created by grasping the current development in a firm's external environment. Firms can proactively sense and shape the path of future development by setting standards, share and by sharing a vision with their partners or other parties in their industry.
- **What are the current initiatives to maintain and ensure product leadership?** Product leadership can be achieved by delivering value to customers. This requires maintaining and improving product superiority, delivery of new products or features, and a continuous build-up of technological assets that capitalize on both internal and external resources.
- **What are the current initiatives to maintain and ensure market leadership?** Market leadership can be achieved through brand visibility, diverse product portfolios, and product interoperability and compatibility that capitalize on both internal and external resources.
- **How can we manage efficiency to improve the way we use both internal and external resources?** Efficiency can be achieved through exploiting a firm's resources, including cost-cutting activities, restructuring and employee cutbacks. Increasing efficiency initiatives can also be traced back to initiatives supporting resources allocation and the underlying decision-process process. Activity systems or platforms that tighten communication, integration and coordination among different functional areas or between partners are some examples of initiatives that increase efficiency.
- **How can we manage dependencies with our competitors and collaborators?** Dependency exists when a firm establish partnerships. Dependency may cause a firm to become trapped in its current competencies and reduce the efficiency of resource mobilization. To avoid this, a firm can exert a certain level of control by maintaining multiple sub-networks and having clear and detailed policies on partnerships. Engaging in multiple sub-networks improves a firm's flexibility and positioning. Policies on partnerships clarify expectations and rules of the game among

partners, which is conducive to manage complexities associated with being dependent on partners.

- **How should we respond to constant rivalries from our competitors?** Responding to constant rivalries in a business network may be done through aggressive actions, such as cutting prices, making acquisitions and alliances to reduce competition, or competing on the basis of radically superior value or breakthrough products, which makes the competition irrelevant.
- **How to manage risks?** Risks in a business network need to be managed by providing legal and formal measures to protect a firm's IP from imitation. Legal measures provide trust and security to firms and their partners. However, they need to be combined with other measures that maintain certain degree of openness, flexibility and interoperability to maintain efficient and effective partnerships.

Identifying key initiatives will help firms to put themselves in a larger context and evaluate the alignment of strategic actions and resources. For example, a good alignment cannot happen when a firm without a strong resource position tries to set its vision for the industry by itself, and firms without strong technological assets may not succeed in reducing competition by providing radically superior product value.

6.4.3. Evaluating the strategic actions firms can employ

The last building block involves determining whether a firm has an integrated strategy in both its competitive and collaborative environments. The key factors are (1) the match between the firm's resources and strategic actions, and (2) the balance between different strategy dimensions. Managing collaboration (of a network of partners), in addition to competition, requires managing multiple dimensions that may have conflicting orientations. Managers may sometimes have to balance their decisions to capture the benefits, reduce the costs and manage the risks. This involves making the choice to balance or place a relative emphasis on certain dimensions of strategic orientation, i.e., *futurity, pro-activeness, defensiveness, analysis, aggressiveness and riskiness*. Placing a relative emphasis on a specific dimension means that a firm's attempts to orchestrate actions that balance the opposite forces that it faces in its external environment, i.e., collaboration versus competition, dependency versus efficiency, dependency versus autonomy, open versus closed collaborations, and short-term versus long-term.

As managers are able to identify strategic initiatives in these building blocks, they can further evaluate the coherence of their strategy. Evaluating the coherence

requires firms to make a choice in each of the six dimensions and the three additional network-related dimensions of their strategy.

- **Futurity**. Does your firm intend to be a vision setter or respond to the immediate future in the network? Does your firm attempt to set a vision based on the common efforts and visions of your strategic partners?
- **Proactiveness**. Does your firm proactively market new innovative products. Are they based on moderate improvements on existing products or on major changes in technology or delivery, both in your competitive and collaborative environments?
- **Internal Defensiveness.** Does your firm emphasize efficiency in the internal resource allocation?
- **External Defensiveness**. Does your firm focus on efficiency in dealing with partnerships? How does your firm ensure that resources are efficiently exchanged among partners and used to leverage your internal resources
- **Internal Analysis.** Does your firm emphasize the analytical aspect to generate the best possible decisions? Does your firm use analytical systems to assess and review the root of problems to support decision-making in place?
- **External Analysis.** Does your firm emphasize the analytical aspect in assessing the benefits and problems that are rooted in partnerships? How do you analytically assess your position and the potential benefits from your network of partnerships? How is information collected and knowledge created and shared among network members?
- **Internal Aggressiveness**. Is your firm aggressive towards your immediate competitors? Can your firm sacrifice its immediate return in favour of long-term return and market position?
- **External Aggressiveness**. What is your firm's posture towards your partnerships? Does it rely on power and autonomy or on dependence to secure its resource position?
- **Riskiness.** Is your firm a risk taker or risk-averse in its decision-making process?

These six dimensions and the three additional network-related dimensions of strategy can be used to evaluate the integrity of a firm's strategy. Having an integrated and coherent strategy shows the manager's ability to balance the benefits and hidden costs embedded their firms' competitive and collaborative environment. The three building blocks appear be the steps that are usually taken by strategy-makers. However, they provide analytical questions to guide executives in diagnosing and evaluating the breadth and coherence of their strategy, which ultimately influences firm performance.

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Appendix A. Regression results

Table A.1. Regression results with ROA as dependent variable (5 outliers are included)

No.	Variables	Model						
		1	2	3	4	5	6	7
1.	Firm Size	.422*** (.000)	.352** (.002)	.313** (.003)	.316** (.003)	.162 (.213)	.156 (.246)	.130 (.377)
2.	Technological assets		-.128 (.181)	-.162 (.168)	-.159 (.180)	-.244* (.054)	-.244* (.055)	-.237 (.168)
3.	Marketing assets		-.258* (.015)	-.063 (.597)	-.059 (.631)	-.077 (.588)	-.075 (.541)	-.055 (.677)
4.	Technological asset_squared			.083 (.488)	-.099 (.516)	.145 (.342)	.146 (.341)	.128 (.436)
5.	Marketing asset_squared			-.341*** (.002)	-.348 ** (.004)	-.354** (.003)	-.357** (.003)	-.393 ** (.002)
6.	Technological x Marketing asset				-.024 (.862)	-.014* (.919)	-.013 * (.925)	.116 (.443)
7.	Centrality					.060 (.560)	.173 (.747)	.323 (.586)
8.	Structural autonomy					.226* (.056)	.205 (.183)	.250 (.119)
9.	Centrality x Structural Autonomy						-.108 (.830)	-.140 (.781)
10.	Technological asset x Centrality							-.078 (.752)
11.	Technological asset x Structural Autonomy							.154 (.182)
12.	Marketing asset x Centrality							.196 (.501)
13.	Marketing asset x Structural Autonomy							-.186 (.100)
	R^2	.150	.256	.377	.401	.490	.490	.407
	Adj. R^2	.139	.227	.336	.353	.434	.426	.301
	R^2 Change	.150	.106	.122	.024	.089	.000	.033
	Sig R^2 change	.000	.006	.001	.090	.003	.832	.409
	F-ratio	14.128	8.927	9.206	8.362	8.753	7.683	3.851
	Sig.	.019	.000	.000	.000	.000	.000	.000
	N	87	87	87	87	87	87	87
	The t-values are between brackets † $p < .10$ * $p < .05$ ** $p < .01$ *** $p < .001$							

Table A.2. Regression results with revenue growth as dependent variable

No.	Variables	Model						
		1	2	3	4	5	6	7
1.	Firm Size	-.083 (.461)	-.118 (.327)	-.074 (.543)	-.091 (.454)	-.344* (.025)	-.366* (.017)	-.358* (.022)
2.	Technological asset		.043 (.703)	-.096 (.543)	-.136 (.348)	-.317† (.036)	-.316* (.036)	-.331† (.102)
3.	Marketing asset		-.096 (.423)	-.095 (.504)	-.140 (.313)	-.173 (.190)	-.164 (.216)	-.129 (.376)
4.	Technological asset_squared			.218 (.141)	.033 (.861)	.117 (.512)	.126 (.484)	.069 (.732)
5.	Marketing asset_squared			.140 (.262)	.210 (.111)	.269 (.035)	.258* (.044)	.221 (.171)
6.	Technological x Marketing asset				-.276 (.117)	-.308 (.067)	-.312† (.063)	-.247 (.229)
7.	Centrality					.017 (.885)	.630 (.310)	.794 (.267)
8.	Structural autonomy					.446** (.002)	.335* (.061)	.328 † (.078)
9.	Centrality x Structural Autonomy						-.587 (.315)	-.603 (.311)
10.	Technological asset x Centrality							-.146 (.580)
11.	Technological asset x Structural Autonomy							.161 (.227)
12.	Marketing asset x Centrality							.263 (.490)
13.	Marketing asset x Structural Autonomy							-.093 (.591)
	R^2	.007	.016	.062	.093	.206	.217	.238
	Adj. R^2	-.006	-.021	.001	.020	.119	.120	.092
	R^2 Change	.007	.010	.046	.030	.113	.011	.020
	Sig F change	.461	.687	.161	.117	.008	.315	.771
	F-ratio	.549	.432	1.013	1.218	2.371	2.222	1.630
	Sig.	.461	.731	.416	.277	.025	.030	.098
	N	82	82	82	82	82	82	82

The t-values are between brackets

† $p > .10$ * $p > .05$ ** $p > .01$ *** $p > .001$

Appendix B. Case selection using fs-QCA

We selected cases for our case study in Chapter 4 based on meaningful configurations that lead to certain categories of firm performance. To obtain these configurations we employ a fuzzy set quantitative configuration analysis (fs-QCA). Using fs-QCA will help us to gain insight into the causal nature of the configuration, establishing a causal relationship between certain configurations with certain outcome, an advantage that is not provided by cluster analysis (Fiss, 2008). Using fs-qca we can find meaningful configurations, i.e., causal mechanisms that consistently lead to high performance. These causal mechanisms are conceptualized as combinations of attributes that are considered to be important in causing differences in the intended outcome (Fiss, 2008).

We followed the steps as done by Fiss (2008) by firstly making fuzzy set measures of the outcome variable, i.e., profitability, and the independent measures, i.e., firm size, technological assets, marketing assets, centrality, and structural autonomy. Fuzzy sets give the precision in the form of quantitative assessment, ranging from full membership (i.e., a score of 1) to full non-membership (i.e., a score of 0) of a certain set (Ragin, 2008). For example, a firm can be fully assessed as high performing firms by having a score of 0.90. Making fuzzy sets requires transforming variables into sets that are calibrated with regard to full membership, full non-membership, and the crossover point on the set of measures by using external criteria (Ragin, 2000; 2008). In our case, we used criteria that are anchored on our samples. We used percentiles from the sample to calibrate the variables both for primary outcome (i.e. a dependent variable) and independent measures (i.e. independent variables) as shown in Table 1.

Table 1. External Criteria for measures calibration

	Threshold point						
	Percentile	Profit (ROA)	Centrality	Structural autonomy	Tech. Asset	Mark. Asset	Size
Full Membership Threshold	Value higher than > 75% percentile	0.085	17.291	.693	.187	.427	2.856
Crossover Point	Value at the 50% percentile	0.038	.072	.485	.153	.311	.981
Full Non Membership Threshold	Value lower than < 25% percentile	-0.042	.018	0	.100	.230	.314

As shown in Table 1, a case is considered as full membership in the category of profitable firms when it has ROA bigger than 0.085 and a case is considered as a full membership in the category of non profitable firm when it has ROA less than -0.042.

All variables were transformed into fuzzy sets using the "direct method" of calibration that focuses on three qualitative anchors that structure fuzzy sets: (1) the threshold for full membership; (2) the threshold of full non-membership; and (3) the crossover point (Ragin, 2008). The transformation was done in two steps (Fiss, 2008):

- Variables scores are translated into the metric of log odds utilizing the criteria that have been anchored in the three qualitative anchors (Ragin, 2008) as shown in Table 1. In this case, a profitability score, in terms of ROA, profitabiliy of 0.085 correspond to a full membership score of ≥.95 and log odds[13]≥ 3 while profitability of -0.042 – 4.2% corresponds to a full non-membership score of ≤ 0.05 and log odds of ≤ -3.
- Membership scores are calculated using the formula below

$$\boldsymbol{Degree\ of\ membership} = \frac{\boldsymbol{e}^{\left(log\left(\frac{p}{1-p}\right)\right)}}{\boldsymbol{1} + \boldsymbol{e}^{\left(log\left(\frac{p}{1-p}\right)\right)}}$$

Following these procedures we have rescaled variables range from 0 to 1 which correspond to qualitative assessment of full membership, cross-point, and full non-membership. Based on these rescaled variables we analyzed the configuration of firm's internal and external resources and identified configurations that consistently lead to high performance.

Table 2 shows the distribution of cases as the result of the analysis of five causal variables with profitability as the outcome. Each row represents a causal mechanism, i.e., a combination of five causal variables, with "1" represents the presence of a causal variable and "0" represents the absence of a causal variable. This gives a total of 32 possible combinations. We left out causal mechanisms with

[13] Calibration using the direct method is aimed at transforming interval-scale variables into the log odds metric that represent the verbal labels reflecting degree memberships (i.e., full memberships, threshold of full membership, mostly in, more in than out, cross over point, more out than in, mostly out, threshold of full non-membership, and full non memberships). These verbal labels are attached to certain degree of memberships. These degree of full memberships are transformed into the odds of full membership using the formula:
odds of membership = (degree of membership)/(1-degree of memberships).
For example, the membership score attached to "threshold of full membership" is 0.953. Converting to an odds yields 20.09. Calculating the natural log of 20.09 yields a score of 3.0. This metric of log odds is useful to have a symmetric around 0.0 (Ragin, 2005).

instances of 2 cases or less, which leaves us with 13 combinations. They are presented in order of their level of consistency. We select combinations with a consistency of over 80%.

Table 2. Distribution of cases across causal mechanisms[1]

Profitability							
Centrality	Structural Autonomy	Technological Asset	Marketing Asset	Size	Number of cases[1]	Outcome code	Consistency[2]
1	1	0	1	1	3	1	0.866078
1	1	0	0	1	11	1	0.861904
1	1	1	1	1	13	1	0.847683
1	1	1	0	1	6	1	0.841116
0	1	1	0	0	3	0	0.719014
0	0	0	0	1	5	0	0.697375
0	0	0	1	1	4	0	0.693521
1	1	1	0	0	3	0	0.650997
1	1	1	1	0	5	0	0.618084
1	0	0	0	0	3	0	0.586648
0	0	0	0	0	6	0	0.574485
0	0	0	1	0	4	0	0.567618
0	0	1	1	0	8	0	0.379911

[1] Number of cases with membership in causal combination > .5

[2] Consistency with subset relation vis-à-vis the outcome. "It assesses the degree to which cases sharing a given condition or combination of conditions agree in displaying the outcome in question" (Fiss, 2008). The proportion of cases is consistent with the outcome.

The result of the truth table algorithm is shown in **Table 3.** The configuration that leads to high profitability shows a consistency level of 0.723, which is considered below the minimum recommended level that is 0.75. However, the coverage is quite high, 0.501, which indicates considerable importance of the causal conditions within this configuration (Fiss, 2008).

The configuration leading to high profitability shows a complex configuration where the presences of centrality, structural autonomy, and employee size with the absence of marketing asset and technological asset are the core causal condition. Firm size is the important factor in influencing firm's profitability. The big firms are well-running machines. They have established routines and processes which increase the efficiency of the firms leading to higher profitability. Technological and marketing assets show inconsistency as causal conditions. As noted in Chapter 3, technological and marketing assets seem to have a threshold to give a positive effect to profitability. This appears to be especially related to the

limitation in the proxies that we used to measure them, namely the R&D expenses relative to sales revenues and the marketing expenses relative to sales revenues. Firms that spend too little or too much portion of its revenue will have poorer performance.

Table 3. Configurations of resources leading to high return on asset

Causal Condition	**ROA**
	1
Centrality	●
Structural Autonomy	●
Technological Asset	
Marketing Asset	
Size (Employees)	●
Raw coverage[1]	0.501
Unique coverage[2]	0.501
Consistency [3]	0.723
Solution Coverage	0.501
Solution Consistency	0.723
Cases with similar configuration but have the same outcome	Microsoft Corp, Adobe Systems Inc, Bea Systems Inc, McAfee Inc, Autodesk Corp, Sybase Inc, Oracle Corp, Amdocs Ltd, SAP AG, BMC Software Inc, Citrix Systems Inc, Epicor Software Corp, Red Hat Inc
Cases with similar configuration but do not fall in the same outcome category	Synopsys Inc, Verisign Inc, Symantec Corp, CA Inc, Open Text Corp, Quest Software Inc, Sungard Data Systems Inc

Coverage assesses how important a causal combination is to achieving the outcome. When there are several paths of causal conditions to the same outcome, the coverage may be small (Ragin, 2006). It is the emprical relevance of a consistence path of causal conditions and measured by the propotion of the sum of membership scores in the outcome. Coverage ($Xi \leq Yi$) = $\sum (\min(Xi, Yi))/\sum(Yi)$, where X is membership score of the causal condition and Y is membership shocre of the outcome (Ragin, 2006).

[1]Raw coverage measures the proportion of memberships in the outcome explained by each configuration of the solution (Ordanini and Maglio, 2009)

[2]Unique coverage measures the proportion of memberships in the outcome explained solely by each individual solution configuration, excluding memberships that are covered by other solution configuration (Ordanini and Maglio, 2009)

[3] Xonsistency measures how often the solution terms and solution as a whole are subsets of the outcome, and they reflect the frequency with which solutions can be considered sufficient conditions for the outcome" (Ordanini and Maglio,

2009).

Notes:

- ● indicates the presence of a peripheral condition (a condition where the causal relationships with the outcome of interest are less evident)
- ● indicates the presence of a core condition (a condition where a strong casual relationships with the outcome of interest is evident)
- ◌ indicates the absence of a peripheral condition (a condition where the causal relationships with the outcome of interest are less evident)
- ◌ indicates the absence of a core condition (a condition where a strong casual relationships with the outcome of interest is evident)

Appendix C. Data collection guide

NO.	DIMENSIONS	QUESTIONS	Sources
A.	**FIRM'S CHARACTERISTICS**		
1.	Firm's main attributes		
	Firm's age	Year the firm is founded	10-k/Annual report
	Main business activities	Primary SIC (Standard Industrial Classification)	www.sec.gov
	Other business activities	Other SICs	www.sec.gov
2.	Product Portfolio		
	Main products	Products and brands	10-K/Annual Report
		What are the market shares of the products?	Annual Report – Letter to shareholders
	Type of products	Consumer products (end user is individual consumer) or Corporate products	10-K
	Products Characteristics A (Gao and Iyer 2009)	Which type of main products this company has? • Service • Application Software • Middleware Services • System Software • Hardware	Annual Report
3.	Firm's positioning	Which companies are main competitors of focal firms?	Yahoo Finance/ Google Finance/ 10-K
		Are these companies from the same SIC?	www.sec.gov

NO.	DIMENSIONS	QUESTIONS	Sources
4.	Revenue model	Different revenue streams?	Annual Report/10-K
		Percentage from each revenue stream?	10-K
B.	**TECHNOLOGICAL LEADERSHIP**		
1.	Internal Resources		
	Product leadership	Introducing new products	Letter to Stockholders/annual report
		R&D infrastructures and initiatives	Letter to Stockholders/annual report
2.	External Resources		
	Firm's Partnerships	How many agreements does a firm develops?	10-K/Annual Report
		- In the reported year?	10-k/Annual report
		- Cumulative years	Company Websites
		What are the reasons of developing relationships?	10-K/Annual Report
	Main partners	Partnership with significant resource investment or involvement?	10-K/Company Websites
		Companies in the supply chain?	Company website
		Companies in different industry domains /product segments (referring to SIC)?	
		Which companies are the firm's main partners?	10 K/Company's website
	What kind of partners?	What kind of partners this company has?	10-K/Company's website
		Referring to product characteristics Which type of products are there?	10-K/Company websites
C.	**MARKET LEADERSHIP**		
1.	Internal resources	Launching a new marketing campaign	Letter to Stockholders/annual report

NO.	DIMENSIONS	QUESTIONS	Sources
		Accessing new market and market domain	Letter to Stockholders/annual report
2.	External resources		
	Main Partnerships	How many agreements does a firm develops?	10-K/Annual Report
		- In the reported year?	10-k/Annual report
		- Cumulative years	Company Websites
		What are the reasons of developing relationships?	10-K/Annual Report
	Main partners	Partnership with significant resource investment or involvement?	10-K/Company Websites
		Companies in the supply chain?	Company website
		Companies in different industry domains /product segments (referring to SIC)?	
		Which companies are the firm's main partners?	10 K/Company's website
	What kind of partners?	What kind of partners this company has?	10-K/Company's website
		Referring to product characteristics, which type of products are there?	10-K/Company websites
D.	**VISION**		
1.	Involvement in gathering activities	Are there any distinct and regular partnerships activity, conference, or gathering?	Company's websites/10-K
2.	Initiatives in setting vision	Taking the first initiatives in creating opportunity or setting standards	News release/analyst report/10-K/Letter's to stockholders
E.	**EFFICIENCY FOCUS**		
1.	**Internal resources**	Cost efficiency	10-K/Letter's to stockholders
		Employee Reduction	10-K
		Improvement effort on companies routines	Letter to stockholders/annual report

NO.	DIMENSIONS	QUESTIONS	Sources
		Reorganization	10-K
		Other cost efficiency effort	10-K/Letter to stockholders
2.	**External resources**		
	Repeated relationships	Repeated relationship with the same companies? Or New relationship with new partners?	10-K
		Are they different type of agreements?	
	Management of partnerships?	Availability of a platform (tools) connecting firm's partners/ecosystems for an exchange of information between programs, regulation connections between firms	Company's websites
F.	**MANAGING DEPENDENCY**		
1.	Mode of governance	How many companies are being acquired?	Letter to stockholders/10-K
		Which companies are they (company being acquired)?	10-K/annual report/news release
		What type of companies are they?	10-K/annual report/news release
		What are the reasons?	10-K/annual report/news release
		- Acquiring new competences/technologies	10-K/annual report/news release
		- Acquiring access to market/gain market share	10-K/annual report/news release
		- Eliminating/foreclosing competition	News release/analyst report
2.	Interoperability	Does a firm provide product or platform technology on which other firms can base their products?	10-K/Annual report/Product description in the websites
		Does a firm choose to vertically integrated products (provide all products in the value chain in-house)?	10-K/Annual report/Product description in the websites
		Does a firm choose to align itself to a standard/platform in which this company	10-K/Annual report/Product description in the websites

NO.	DIMENSIONS	QUESTIONS	Sources
		involved?	
3.	Policy on partnerships	Their policy on partnership	Company's websites/corporate governance
G.	**MANAGING RISK AND CONTROL**		
1.	Protection mechanism	The proprietary asset protection policy	10-K/corporate governance
2.	Technology Architecture	Open vs close technology architecture	10-K/company website
H.	**CONSTANT RIVALRY**		
1.	Price mechanism	Price Cutting or price predatory	10-K/annual report
2.	Acquisitions	Acquisitions for foreclosing/eliminating competition or growth	News release/analyst report

Appendix D. Refined items based on the independent judgment

No	GENERATED ITEMS	ACTION TAKEN	REFINED ITEMS
	AGGRESSIVENESS		
1.	We abandon existing long term relationship when new opportunities arise and other changes make current relationship obsolete	None	We abandon existing long term relationships when new opportunities arise and other changes make current relationships obsolete
2.	We maintain strong bargaining power in relation to other players in the ecosystem-including key customers and valued suppliers	Rewording	We focus on exercising a strong bargaining position in relation to our business partners, customers and valued suppliers
3.	We block other companies' attempts to clone your contributions and/or to join with opposing leadership and visions for the whole, that may render your contributions less valuable	Rewording	We often block other companies' attempts to clone our contributions and/or other companies' attempts to join with opposing leadership that may render our contributions in the network less valuable
4.	We usually willing to dedicate whatever people and resources it takes to ensure that your approach is the market standard in its class trough dominating key market segments	Rewording	We are usually willing to dedicate whatever people and resources it takes to ensure that our approach is the market standard in its class trough dominating key market segments
5.	We becomes a savvy buyer, resisting excessive dependence upon other members of the system-and insist that the overall ecosystem structure reflect substantial customer interests	Rewording and moved to *Riskiness*	
6.		Reclassified from *Defensiveness*	We adopt measures that discourage opportunistic behavior (cheating or leaking information to competitors) in our networks
7.	We often sacrifice profitability to gain	None	

No	GENERATED ITEMS	ACTION TAKEN	REFINED ITEMS
	market share		
8.	We often cut prices to increase market share	None	
9.	We often set prices below competition	None	
	We often seek market share position at the expense of cash flow and profitability	None	
1.	**ANALYSIS**		
2.	We carefully design process interfaces and to contribute to network resource pool which enable link our resources and activities into the overall value creation of the network	rewording	We carefully design our processes and resource pool in order to improve the overall value creation processes in our business network
3..	We conduct periodic reviews of our relationships to understand what we are doing right and where we are going wrong	rewording	We conduct periodic reviews of our network relationships to understand what we are doing right and wrong
4.	We examine our existing network position and the need to develop new ones	rewording	We examine our existing business positions and investigate the potential of new partnerships
5.	We ensure integration of network benefits and of external resources offered by other partners into internal operation	Rewording	We ensure that network benefits and external resources offered by other partners are integrated into our internal operation
6.	We proactively reduce uncertainty by decreasing information gaps and providing crucial context for players in its network	rewording	We decrease information gaps in our business network which can provide a crucial context for other members in our network
7.	We assess the value of relevant knowledge residing at different points in the network and can arrange its transfer to other points in the network when it is needed	Rewording	We carefully assess the value of relevant knowledge that enters our company before we take action upon it
8.	We critically and openly review our social, intellectual, human, technological, and financial investments and its return before a decision to invest further into the development of relationship is made	rewording	We critically and openly review our social, intellectual, human, technological, and financial investments and its return before making a decision to invest further into the development of a

No	GENERATED ITEMS	ACTION TAKEN	REFINED ITEMS
			relationship
9.	We emphasis effective coordination among different functional areas	Rewording	We emphasis effective coordination among different functional areas in our firm
10.	We require a great deal of factual information to support our day-to-day decision making	Rewording	We require a great deal of factual information to support day-to-day decision making
11.	We tend to be highly analytical in our decision making	Rewording	We tend to be highly analytical in our decision making processes
12.	We use several planning techniques	None	We use several planning techniques
13.	We use the outputs of management information and control systems	None	We use the outputs of management information and control systems
	We commonly use manpower planning and performance appraisal of senior managers	None	We commonly use manpower planning and performance appraisal of senior managers
1.	**DEFENSIVENESS**		
2.	We invest in network position by maintaining and investing in a number of strong, long-term business relationship with its partners	rewording	We maintain a number of strong and long-term business relationships with our partners
3.	We systematically coordinate our strategies across different relationship	Rewording	We systematically coordinate our strategies with partners in our networks
4.	We encourage our employee to interact with employees of our partner organization in informal settings even outside of work	Rewording	We encourage our employees to interact with employees of our partner organizations
5.	We increase productivity by simplifying the complex task of connecting network participants to each other and by making the creation of new products by other parties	Rewording	We increase productivity by knowing which network participants to connect to each other
6.	We maintain tight coupling with our direct connections to manage risks and dependencies	Rewording	We constantly try to optimize our specific assets in order to increase the value of the assets provided by our partners

No	GENERATED ITEMS	ACTION TAKEN	REFINED ITEMS
7.	We maintain loose coupling with indirect connections to embrace mobility and flexibility.	Rewording and moved to *Riskiness*	
8.	We ensure that it is privy to the relevant development of activities of network members that there is no attempt to "cheat" by the partners and that innovations are not leaked to actors who are linked to competing networks	Rewording and moved to *Aggressiveness*	
9.	We create multiple knowledge sharing processes and sub-networks in the larger network	Rewording	We create multiple knowledge sharing processes to enable efficient flows in our business networks
10.	We seek to do a better job of meeting needs that are already being addressed, with resources that are already harnessed	Rewording	We always try to continuously improve upon meeting existing needs with resources that are already harnessed
11.	We occasionally conduct significant modifications to manufacturing technology	None	We occasionally conduct significant modifications to our business processes
31.	We often use cost control systems for monitoring performance	None	We often use cost control systems for our business processes
32.	We often use production management techniques	None	We often use production (of goods or services) management techniques
33.	We often emphasize product quality through the use of quality circles	None	We often emphasize product (of goods or services) quality through the use of quality circles
	FUTURITY		
1.		Added	We emphasize the importance of having a balance between creating strong and long term relationships with the new ones
2.		Added	We routinely follow and/or organize various forums to create shared vision about the future
3.		Added	We emphasize balancing the future needs of our organization with the future

No	GENERATED ITEMS	ACTION TAKEN	REFINED ITEMS
			needs of our partners
4.	We carry out long-term research to provide us with a future competitive advantage	None	We carry out long-term research to provide us with a future competitive advantage
5.	Our criteria for budget allocations generally reflect short-term considerations	None	Our criteria for budget allocations generally reflect short-term considerations
6.	We often conduct “what-if” analyses of critical issues	None	We often conduct “what-if” analyses of critical issues
7.	Formal tracking of significant general trends is common	None	Formal tracking of significant general trends is common
8.	Forecasting key indicators of operations is common	None	Forecasting key indicators of operations is common
	PRO-ACTIVENESS		
1.	We create strategic relations with prominent client/leaders in different domains which might be long term and personal to ensure reaching the commercial level	Rewording	We often take initiatives to create strategic relations with prominent client/leaders in different domains
2.	We establish framework of co-evolution that bring together the competencies of many firms and then help these communities to grow	Rewording	We establish a framework of co-evolution that brings together the competencies of many firms that helps these communities to grow
3.	We work with different partners to bring new ideas to invest in new resources, activities, and partners to the existing network	Rewording	We open the possibilities of other firms leveraging, building on, or extending our products
4.	We develop an array of informal relationship with organizations that currently are outside our core business area	rewording	We develop an array of informal relationships with organizations that currently are outside our core business area
5.	We identify powerful, unmet needs and fragmented, underutilized resources and invent new value chains that bring resources and needs together in creative ways	Rewording	We identify unmet needs and fragmented, underutilized resources and invent new value chains that bring resources and needs together in creative ways
6.	We actively monitor our environment and gather information to identify partnering opportunities	Rewording	We actively monitor our environment to identify partnering opportunities

No	GENERATED ITEMS	ACTION TAKEN	REFINED ITEMS
7.		Added	We foster knowledge transfer among our business partners when needed
8.		Added	We bring new partners into our network to create the possibilities to tap into their resources, activities, and partners
9.	We are constantly seeking new opportunities related to present operation	Rewording	We are always searching for new business opportunities
10.	We are usually the first ones to introduce new brands or products in the market	None	We are usually the first one to introduce new brands or products in the market
11.	We are constantly look for business that can be acquired	None	We are frequently looking for business units to acquire
12.	Operations in later stages of the life cycle are strategically eliminated	Changed	We generally expand capacity ahead of our competitors
	RISKINESS		
1.		Reclassified from *Aggressiveness*	We avoid excessive dependence on other members of the network
2.		Reclassified from *Defensiveness*	We develop minimal asset specificity to leverage wider assets provided by different partners in different domains
3.	In general, our mode of operations is riskier than our competitors'	None	In general, our mode of operations is riskier than that of our competitors'
4.	We adopt a rather conservative view when making major decisions	None	We adopt a (rather) conservative view when making major decisions
5.	Our business operations generally follow 'tried and true' paths	None	Our business operations generally follow 'tried and true' paths
6.	We tend to be risk-averse	None	We tend to be risk-averse

Appendix E. Online expert survey

Main section

Thank you for participating in this survey.

1. This questionnaire consists of :
   - The definition of six dimensions of firm's strategic orientation
   - List of statements which describe various key strategic orientation of firm in a business network
   - Comments and remarks which you feel are important to be addressed
2. There are 32 statements in this questionnaire
3. Please note that responding to all statements is necessary before you can submit

Definition

2

Main-question

We would like you first to read the definition and statements and invite you to indicate which item corresponds to which dimension of strategic orientation.

Definition:

Aggressiveness (AGRS)
This dimension reflects the posture adopted by an organization in allocating its resources for improving market positions at a relatively faster rate than the competitors in its chosen market (Venkatraman 1989).

Analysis (ANAL)
This dimension refers to the tendency of an organization to search deeper for the roots of problems and to generate the best possible solutions alternatives (Venkatraman, 1989).

Defensiveness (DEFV)
This dimension captures the defensive behavior of an organization through the extent to which the organization employs cost reduction and efficiency seeking methods (Venkatraman 1989).

Futurity (FUTU)
This dimension reflects temporal considerations embedded in key strategic decisions, in terms of relative emphasis of effectiveness considerations versus efficiency considerations (Venkatraman 1989).

Proactiveness (PROA)
This dimension reflects pro-active behavior about participation in emerging industries, continuous search for market opportunities, and experimentation with potential responses to changing environmental trends (Venkatraman 1989).

Riskiness (RISK)
This dimension captures the extent of risks in various resource allocation decisions as well as choice of products and markets (Venkatraman 1989).

A.
Please tick one corresponding dimension for each statement or tick "none of these" if you think the statement does not belong to any dimension. The statements are randomly arranged and the number of statements in each dimension does not necessarily have to be equally distributed

		Aggressiveness	Analysis	Defensiveness	Futurity	Pro-activeness	Riskiness	None of those
1.	We carefully design process interfaces to contribute to the network resource pool which enables us to link our resources and activities to the overall value creation processes of the network	○	○	○	○	○	○	○
2.	We abandon existing long term relationships when new opportunities arise and when other changes make current relationships obsolete	○	○	○	○	○	○	○
3.	We conduct periodic reviews of our network relationships to understand what we are doing right and wrong	○	○	○	○	○	○	○
4.	We emphasize the importance of maintaining strong and long-term relationship and creating new relationships	○	○	○	○	○	○	○
5.	We maintain strong bargaining power in relation to other members in the network including key customers and valued suppliers	○	○	○	○	○	○	○
6.	We create strategic relations with prominent client/leaders in different domains which may be strong and long term	○	○	○	○	○	○	○
7.	We often block other companies' attempts to clone our contributions and/or other companies' attempts to join with opposing leadership that may render our contributions in the network less valuable	○	○	○	○	○	○	○
8.	We establish a framework of co-evolution that brings together the competencies of many firms and then help these communities to grow	○	○	○	○	○	○	○

We would like you first to read the definition and statements and invite you to indicate which item corresponds to which dimension of strategic orientation.

Definition:

Aggressiveness (AGRS)
This dimension reflects the posture adopted by an organization in allocating its resources for improving market positions at a relatively faster rate than the competitors in its chosen market (Venkatraman 1989).

Analysis (ANAL)
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This dimension reflects temporal considerations embedded in key strategic decisions, in terms of relative emphasis of effectiveness considerations versus efficiency considerations (Venkatraman 1989).

Proactiveness (PROA)
This dimension reflects pro-active behavior about participation in emerging industries, continuous search for market opportunities, and experimentation with potential responses to changing environmental trends (Venkatraman 1989).

Riskiness (RISK)
This dimension captures the extent of risks in various resource allocation decisions as well as choice of products and markets (Venkatraman 1989).

B.

Please tick one corresponding dimension for each statement or tick "none of these" if you think the statement does not belong to any dimension. The statements are randomly arranged and the number of statements in each dimension does not necessarily have to be equally distributed

		Aggressiveness	Analysis	Defensiveness	Futurity	Pro-activeness	Riskiness	None of those
1.	We examine our existing positions in our network and we examine the need to develop new ones	○	○	○	○	○	○	○
2.	We open the possibilities of other firms leveraging, building on, or extending our products	○	○	○	○	○	○	○
3.	We are willing to transfer knowledge between different points in the network when needed	○	○	○	○	○	○	○
4.	We ensure that network benefits and external resources offered by other partners are integrated into our internal operation	○	○	○	○	○	○	○
5.	We develop an array of informal relationships with organizations that currently are outside our core business area	○	○	○	○	○	○	○
6.	We decrease information gaps in our network and provide crucial contex for players in our network	○	○	○	○	○	○	○
7.	We identify powerful, unmet needs and fragmented, underutilized resources and invent new value chains that bring resources and needs together in creative ways	○	○	○	○	○	○	○
8.	We assess the value of relevant knowledge residing at different points in the network	○	○	○	○	○	○	○

We would like you first to read the definition and statements and invite you to indicate which item corresponds to which dimension of strategic orientation.

Definition:

Aggressiveness (AGRS)
This dimension reflects the posture adopted by an organization in allocating its resources for improving market positions at a relatively faster rate than the competitors in its chosen market (Venkatraman 1989).

Analysis (ANAL)

This dimension refers to the tendency of an organization to search deeper for the roots of problems and to generate the best possible solutions alternatives (Venkatraman, 1989).

Defensiveness (DEFV)
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Proactiveness (PROA)
This dimension reflects pro-active behavior about participation in emerging industries, continuous search for market opportunities, and experimentation with potential responses to changing environmental trends (Venkatraman 1989).

Riskiness (RISK)
This dimension captures the extent of risks in various resource allocation decisions as well as choice of products and markets (Venkatraman 1989).

C.

Please tick one corresponding dimension for each statement or tick "none of these" if you think the statement does not belong to any dimension. The statements are randomly arranged and the number of statements in each dimension does not necessarily have to be equally distributed

		Aggressiveness	Analysis	Defensiveness	Futurity	Pro-activeness	Riskiness	None of those
1.	We invest in a number of strong and long-term business relationships with our partners	○	○	○	○	○	○	○
2.	We are usually willing to dedicate whatever people and resources it takes to ensure that our approach is the market standard in its class trough dominating key market segments	○	○	○	○	○	○	○
3.	We systematically coordinate our strategies with partners in our networks	○	○	○	○	○	○	○
4.	We encourage our employees to interact with employees of our partner organizations	○	○	○	○	○	○	○
5.	We avoid excessive dependence on other members of the network	○	○	○	○	○	○	○
6.	We increase productivity by simplifying the complex task of connecting network participants to each other	○	○	○	○	○	○	○
7.	We develop highly specific assets to leverage the assets provided by our partners	○	○	○	○	○	○	○
8.	We develop minimal asset specifity to leverage wider assets provided by different partners in different domains	○	○	○	○	○	○	○

We would like you first to read the definition and statements and invite you to indicate which item corresponds to which dimension of strategic orientation.

Definition:

Aggressiveness (AGRS)
This dimension reflects the posture adopted by an organization in allocating its resources for improving market positions at a relatively faster rate than the competitors in its chosen market (Venkatraman 1989).

Analysis (ANAL)
This dimension refers to the tendency of an organization to search deeper for the roots of problems and to generate the best possible solutions alternatives (Venkatraman, 1989).

Defensiveness (DEFV)
This dimension captures the defensive behavior of an organization through the extent to which the organization employs cost reduction and efficiency seeking methods (Venkatraman 1989).

Futurity (FUTU)
This dimension reflects temporal considerations embedded in key strategic decisions, in terms of relative emphasis of effectiveness considerations versus efficiency considerations (Venkatraman 1989).

Proactiveness (PROA)
This dimension reflects pro-active behavior about participation in emerging industries, continuous search for market opportunities, and experimentation with

potential responses to changing environmental trends (Venkatraman 1989).

Riskiness (RISK)
This dimension captures the extent of risks in various resource allocation decisions as well as choice of products and markets (Venkatraman 1989).

D.

Please tick one corresponding dimension for each statement or tick "none of these" if you think the statement does not belong to any dimension. The statements are randomly arranged and the number of statements in each dimension does not necessarily have to be equally distributed

		Aggressiveness	Analysis	Defensiveness	Futurity	Pro-activeness	Riskiness	None of those
1.	We bring new partners into our network to tap into their resources, activities, and partners	○	○	○	○	○	○	○
2.	We seek to do a better job of meeting needs that are already being addressed, with resources that are already harnessed	○	○	○	○	○	○	○
3.	We routinely follow and/or organize various forums to create shared vision about the future	○	○	○	○	○	○	○
4.	We create multiple knowledge sharing processes in our networks	○	○	○	○	○	○	○
5.	We adopt measures that discourage opportunistic behavior (cheating or leaking information to competitors) in our networks	○	○	○	○	○	○	○
6.	We actively monitor our environment and gather information to identify partnering opportunities	○	○	○	○	○	○	○
7.	We emphasize balancing the future needs of our organization with the future needs of our partners	○	○	○	○	○	○	○
8.	We critically and openly review our social, intellectual, human, technological, and financial investments and its return before making a decision to invest further into the development of a relationship	○	○	○	○	○	○	○

Comments and addtional remarks can be addresed in the following space

E. Comments and addtional remarks can be addresed in the following space

End questionnaire

End page

Thank you very much for your participation in this survey. We really value your expertise and contribution in this study.

Should you want to have a printed copy of this questionnaire, you can click on the following link:

[!PRINT!]

Appendix F. Assessment of substantive validity

ITEMS	*Nc*	*No*	*Psa*	*Csv*
We abandon existing long term relationships when new opportunities arise and other changes make current relationships obsolete	1	3	0,14	-0,29
We focus on exercising a strong bargaining position in relation to our business partners, customers and valued suppliers	1	4	0,14	-0,43
We often block other companies' attempts to clone our contributions and/or other companies' attempts to join with opposing leadership that may render our contributions in the network less valuable	2	4	0,29	-0,29
We are usually willing to dedicate whatever people and resources it takes to ensure that our approach is the market standard in its class trough dominating key market segments	2	2	0,29	0,00
We adopt measures that discourage opportunistic behavior (cheating or leaking information to competitors) in our networks	2	2	0,29	0,00
We carefully design our processes and resource pool in order to improve the overall value creation processes in our business network	3	1	0,43	0,29
We conduct periodic reviews of our network relationships to understand what we are doing right and wrong	6	1	0,86	0,71
We examine our existing business positions and investigate the potential of new partnerships	1	3	0,14	-0,29
We ensure that network benefits and external resources offered by other partners are integrated into our internal operation	1	2	0,14	-0,14
We decrease information gaps in our business network which can provide a crucial context for other members in our network	2	2	0,29	0,00
We carefully assess the value of relevant knowledge that enters our company before we take action upon it	4	2	0,57	0,29
We critically and openly review our social, intellectual, human, technological, and financial investments and its return before making a decision to invest further into the development of a relationship	2	3	0,29	-0,14
We maintain a number of strong and long-term business relationships with our partners	3	2	0,43	0,14
We systematically coordinate our strategies with partners in our networks	0	3	0,00	-0,43
We encourage our employees to interact with employees of our partner organizations	0	3	0,00	-0,43
We increase productivity by knowing which network participants to connect to each other	1	4	0,14	-0,43
We constantly try to optimize our specific assets in order to increase the value of the assets provided by our partners	0	3	0,00	-0,43
We always try to continuously improve upon meeting existing needs with resources that are already harnessed	3	2	0,43	0,14
We create multiple knowledge sharing processes to enable efficient flows in our business networks	2	3	0,29	-0,14
We emphasize the importance of having a balance between creating strong and long term relationships with the new ones	2	2	0,29	0,00

ITEMS	*Nc*	*No*	*Psa*	*Csv*
We routinely follow and/or organize various forums to create shared vision about the future	5	1	0,71	0,57
We emphasize balancing the future needs of our organization with the future needs of our partners	2	4	0,29	-0,29
We often take initiatives to create strategic relations with prominent client/leaders in different domains	5	1	0,71	0,57
We establish a framework of co-evolution that brings together the competencies of many firms that helps these communities to grow	4	2	0,57	0,29
We open the possibilities of other firms leveraging, building on, or extending our products	2	3	0,29	-0,14
We develop an array of informal relationships with organizations that currently are outside our core business area	4	3	0,57	0,14
We identify unmet needs and fragmented, underutilized resources and invent new value chains that bring resources and needs together in creative ways	4	1	0,57	0,43
We actively monitor our environment to identify partnering opportunities	3	2	0,43	0,14
We bring new partners into our network to create the possibilities to tap into their resources, activities, and partners	4	1	0,57	0,43
We foster knowledge transfer among our business partners when needed	4	2	0,57	0,29
We avoid excessive dependence on other members of the network	3	2	0,43	0,14
We develop minimal asset specificity to leverage wider assets provided by different partners in different domains	3	3	0,43	0,00

Note:
n_c represents the number of experts assigning an item to its posited dimension
n_0 represents the highest number of assignments of the item to any other dimension in the set
p_{sa} represents the proportion of substantive agreement
C_{sv} represents the substantive-validity coefficient

Appendix G. Refined items based on academic and industry experts opinion

No	ITEMS	ACTION TAKEN	REFINED ITEMS
	AGGRESSIVENESS		
1.	We abandon existing long term relationships when new opportunities arise and other changes make current relationships obsolete	Rewording	We abandon existing long term relationships when they are no longer relevant
2.	We focus on exercising a strong bargaining position in relation to our business partners, customers and valued suppliers	None	We focus on exercising a strong bargaining position in relation to our business partners, customers and valued suppliers
3.	We often block other companies' attempts to clone our contributions and/or other companies' attempts to join with opposing leadership that may render our contributions in the network less valuable	Rewording	We often block other companies' attempts to copy our contributions and/or their attempts to oppose us in a way that may render our contributions in the network less valuable
4.	We are usually willing to dedicate whatever people and resources it takes to ensure that our approach is the market standard in its class trough dominating key market segments	Rewording	We are willing to dedicate whatever people and resources are necessary to ensure that our approach will become the dominant market standard
5.	We adopt measures that discourage opportunistic behavior (cheating or leaking information to competitors) in our networks	Rewording	We sanction opportunistic behavior (cheating or leaking information to competitors) in our networks
6.	We often sacrifice profitability to gain market share	None	We often sacrifice profitability to gain market share
7.	We often cut prices to increase market share	None	We often cut prices to increase market share
8.	We often set prices below competition	None	We often set prices below competition
9.	We often seek market share position at the expense of cash flow and profitability	None	We often seek market share position at the expense of cash flow and profitability
	ANALYSIS		
1.	We carefully design our processes and resource pool in order to improve the overall value creation processes in our business network	Rewording	We design our processes and resource pool in order to improve the overall value creation in our business network

No	ITEMS	ACTION TAKEN	REFINED ITEMS
2.	We conduct periodic reviews of our network relationships to understand what we are doing right and wrong	Rewording	We conduct periodic reviews of our network relationships to understand what we are doing right and
3..	We examine our existing business positions and investigate the potential of new partnerships	Rewording	We periodically examine our existing business positions and investigate the potential of new partnerships
4.	We ensure that network benefits and external resources offered by other partners are integrated into our internal operation	Rewording	We thoroughly check the benefits from our partnerships before integrating them into our internal operation
5.	We decrease information gaps in our business network which can provide a crucial context for other members in our network	Rewording	We collect and share information that provide a context for other members in our network
6.	We carefully assess the value of relevant knowledge that enters our company before we take action upon it	Rewording	We thoroughly assess the value of relevant knowledge that enters our company before we take action upon it
7.	We critically and openly review our social, intellectual, human, technological, and financial investments and its return before making a decision to invest further into the development of a relationship	Rewording	We critically and openly review the benefits of our partnerships and their return before making a decision to continue developing a new relationship
8.	We emphasis effective coordination among different functional areas in our firm	None	We emphasis effective coordination among different functional areas in our firm
9.	We require a great deal of factual information to support day-to-day decision making	None	We require a great deal of factual information to support day-to-day decision making
10.	We tend to be highly analytical in our decision making processes	None	We tend to be highly analytical in our decision making processes
11.	We use several planning techniques	None	We use several planning techniques
12.	We use the outputs of management information and control systems	None	We use the outputs of management information and control systems
13.	We commonly use manpower planning and performance appraisal of senior managers	None	We commonly use manpower planning and performance appraisal of senior managers
	DEFENSIVENESS		
1.	We maintain a number of strong and long-term business relationships with	None	We maintain a number of strong and long-lasting business

No	ITEMS	ACTION TAKEN	REFINED ITEMS
	our partners		relationships with our partners
2.	We systematically coordinate our strategies with partners in our networks	Rewording	We strongly align our strategies with partners in our networks
3.	We encourage our employees to interact with employees of our partner organizations	Rewording	We encourage our employees to engage into interaction with employees of our partner organizations
4.	We increase productivity by knowing which network participants to connect to each other	Rewording	We increase productivity by connecting specific network partners to each other
5.	We constantly try to optimize our specific assets in order to increase the value of the assets provided by our partners	Rewording	We constantly adapt our specific assets in order to increase the value of the assets provided by our partners
6.	We always try to continuously improve upon meeting existing needs with resources that are already harnessed	Rewording	We try to meet existing needs with resources that are already exploited
7.	We create multiple knowledge sharing processes to enable efficient flows in our business networks	Rewording	We enable efficient knowledge flows by using robust knowledge sharing processes
8.	We occasionally conduct significant modifications to our business processes	None	We occasionally conduct significant modifications to our business processes
9.	We often use cost control systems for our business processes	None	We often use cost control systems for our business processes
10.	We often use production (of goods or services) management techniques	None	We often use production (of goods or services) management techniques
11.	We often emphasize product (of goods or services) quality through the use of quality circles	None	We often emphasize product (of goods or services) quality through the use of quality circles
	FUTURITY		
1.	We emphasize the importance of having a balance between creating strong and long term relationships with the new ones	Rewording	We emphasize the importance of having a balance between maintaining strong and long-standing relationships with creating the new ones
2.	We routinely follow and/or organize various forums to create shared vision about the future	None	We routinely follow and/or organize various forums to create a shared vision about the future

No	ITEMS	ACTION TAKEN	REFINED ITEMS
3.	We emphasize balancing the future needs of our organization with the future needs of our partners	Rewording and split into two items	When developing our future in the network, we consider the future needs of our partners
4.			We balance the needs of our organization with the needs of our partners
5.	We carry out long-term research to provide us with a future competitive advantage	None	We carry out long-term research to provide us with a future competitive advantage
6.	Our criteria for budget allocations generally reflect short-term considerations	None	Our criteria for budget allocations generally reflect short-term considerations
7.	We often conduct "what-if" analyses of critical issues	None	We often conduct "what-if" analyses of critical issues
8.	Formal tracking of significant general trends is common	None	Formal tracking of significant general trends is common
9.	Forecasting key indicators of operations is common	None	Forecasting key indicators of operations is common
	PRO-ACTIVENESS		
1.	We often take initiatives to create strategic relations with prominent client/leaders in different domains	Rewording	We often take initiatives to create strategic relations with prominent client/leaders in different domains
2.	We establish a framework of co-evolution that brings together the competencies of many firms that helps these communities to grow	Rewording	We establish a framework of co-evolution that brings together the competencies of many firms that helps these communities to develop
3.	We open the possibilities of other firms leveraging, building on, or extending our products	Rewording	We create the possibilities of other firms leveraging, building on, or extending our products
4.	We foster knowledge transfer among our business partners when needed	None	We foster knowledge transfer among our business partners when needed
5.	We develop an array of informal relationships with organizations that currently are outside our core business area	Rewording	We consider informal relationships with organizations that currently are outside our core business area
6.	We identify unmet needs and fragmented, underutilized resources and invent new value chains that bring resources and needs together in creative ways	Rewording	We identify unmet needs and invent new value chains that bring resources and needs together in creative ways
7.	We bring new partners into our network to create the possibilities to tap into their resources, activities, and	None	We bring new partners into our network to create possibilities for us to tap into their

No	ITEMS	ACTION TAKEN	REFINED ITEMS
	partners		resources, activities, and partners
8.	We actively monitor our environment to identify partnering opportunities	Rewording	We actively monitor our environment to identify valuable partners
9.	We are always searching for new business opportunities	None	We are always searching for new business opportunities
10.	We are frequently looking for business units to acquire	None	We are frequently looking for business units to acquire
11.	We generally expand capacity ahead of our competitors	None	We generally expand capacity ahead of our competitors
12.	We are usually the first one to introduce new brands or products in the market	None	We are usually the first one to introduce new brands or products in the market
	RISKINESS		
1.	We avoid excessive dependence on other members of the network	None	We avoid excessive dependence on other members of the network
2.	We develop minimal asset specificity to leverage wider assets provided by different partners in different domains	Rewording	We develop generic assets to increase the scope of our business network
3.	In general, our mode of operations is riskier than that of our competitors'	None	In general, our mode of operations is riskier than that of our competitors'
4.	We adopt a (rather) conservative view when making major decisions	None	We adopt a (rather) conservative view when making major decisions
5.	Our business operations generally follow 'tried and true' paths	None	Our business operations generally follow 'tried and true' paths
6.	We tend to be risk-averse	None	We tend to be risk-averse

Appendix H. Questionnaire for instrument testing

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FIRM'S STRATEGY MAKING IN A BUSINESS NETWORK

This questionnaire addresses a key question in strategic network research:

"Why do firms differ in their behaviors in the network?"

This survey will ask your perception on your firm's characteristics and your firm's strategic orientation in the business network. The time required to complete this questionnaire is around **10 minutes**.

Please return the completed questionnaire by **August 7, 2009** using the attached postage-paid envelope.

Thank you very much in advance for your cooperation

Firm's General Information

Firm Information		
Name of the firm		
Year this firm is founded		
What are the ***two*** main business domain of your firm?	1.	2.
Contact Information		
Your position		
Number of years you hold this position		
Number of years you have been in this firm		

We appreciate your help in completing this survey. Please provide the following information about yourself that we can send you a summary of the findings from this survey (You can also attach your business card).	
Your name	
Your phone number	
Your e-mail address	

TU Delft Delft University of Technology

Firm's Strategic Orientation:

Please indicate ***the* extent** to which you ***agree or disagree*** with the following statements
1: strongly disagree.....**4:** neither agree nor disagree.....**7 :** strongly agree

	1	2	3	4	5	6	7
We abandon existing long term relationships when they are no longer relevant	○	○	○	○	○	○	○
We bargain hard in relation to our business partners, customers and valued suppliers	○	○	○	○	○	○	○
We often block other companies' attempts to copy our contributions and/or their attempts to oppose us in a way that may render our contributions in the network less valuable	○	○	○	○	○	○	○
We are willing to dedicate whatever people and resources are necessary to ensure that our approach will become the dominant market standard	○	○	○	○	○	○	○
We sanction opportunistic behavior (cheating or leaking information to competitors) in our networks	○	○	○	○	○	○	○
We often sacrifice profitability to gain market share	○	○	○	○	○	○	○
We often cut prices to increase market share	○	○	○	○	○	○	○
We often set prices below competition	○	○	○	○	○	○	○
We often seek market share position at the expense of cash flow and profitability	○	○	○	○	○	○	○

	1	2	3	4	5	6	7
We maintain a number of strong and long-lasting business relationships with our partners	○	○	○	○	○	○	○
We strongly align our strategies with partners in our networks	○	○	○	○	○	○	○
We encourage our employees to engage into interaction with employees of our partner organizations	○	○	○	○	○	○	○
We increase productivity by forging/making connection between network partners	○	○	○	○	○	○	○
We constantly adapt our own specific assets in order to increase the value of the assets provided by our partners	○	○	○	○	○	○	○
We try to meet current demands with resources that are already possessed	○	○	○	○	○	○	○
We enable efficient knowledge flows by using robust knowledge sharing processes	○	○	○	○	○	○	○
We occasionally conduct significant modifications to our business processes	○	○	○	○	○	○	○
We often use cost control systems for our business processes	○	○	○	○	○	○	○
We often use production (of goods or services) management techniques	○	○	○	○	○	○	○
We often emphasize product/services quality through the use of quality circles	○	○	○	○	○	○	○

TU Delft Delft University of Technology

Firm's Strategic Orientation:

Please indicate ***the* extent** to which you ***agree or disagree*** with the following statements
1: strongly disagree.....**4:** neither agree nor disagree.....**7 :** strongly agree

	1	2	3	4	5	6	7
We emphasize the importance of maintaining balance between strong and long-standing relationships with creating new ones	○	○	○	○	○	○	○
We routinely follow and/or organize various forums to create a shared vision about the future	○	○	○	○	○	○	○
When developing our future in the network, we consider the future needs of our partners	○	○	○	○	○	○	○
We balance the needs of our organization with the needs of our partners	○	○	○	○	○	○	○
We carry out long-term research to provide us with a future competitive advantage	○	○	○	○	○	○	○
Our criteria for budget allocations generally reflect short-term considerations	○	○	○	○	○	○	○
We often conduct "what-if" analyses of critical issues	○	○	○	○	○	○	○
Formal tracking of significant general trends is common in our organization	○	○	○	○	○	○	○
Forecasting key indicators of operations is common in our organization	○	○	○	○	○	○	○

	1	2	3	4	5	6	7
We often take initiatives to create strategic relations with prominent client/leaders in ***different*** domains	○	○	○	○	○	○	○
We establish a framework of co-evolution that brings together the competencies of many firms that helps our network to develop	○	○	○	○	○	○	○
We create the possibilities of other firms leveraging, building on, or extending our products	○	○	○	○	○	○	○
We foster knowledge transfer among our business partners when needed	○	○	○	○	○	○	○
We consider informal relationships with organizations that currently are ***outside*** our core business area	○	○	○	○	○	○	○
We identify unmet needs and invent new value chains that bring resources and needs together in creative ways	○	○	○	○	○	○	○
We bring new partners into our network to create possibilities for us to use their resources, activities, and partners	○	○	○	○	○	○	○
We actively monitor our environment to identify valuable partners	○	○	○	○	○	○	○
We are always searching for new business opportunities	○	○	○	○	○	○	○
We are frequently looking for businesses to acquire	○	○	○	○	○	○	○
We generally expand capacity ahead of our competitors	○	○	○	○	○	○	○
We are usually the first one to introduce new brands or products in the market	○	○	○	○	○	○	○

TU Delft Delft University of Technology

Firm's Strategic Orientation:

Please indicate ***the* extent** to which you ***agree or disagree*** with the following statements
1: strongly disagree.....**4:** neither agree nor disagree.....**7 :** strongly agree

	1	2	3	4	5	6	7
We design our processes and resource pool in order to improve the overall value creation in our business network	○	○	○	○	○	○	○
We conduct periodic reviews of our network relationships to understand what we are doing right and wrong	○	○	○	○	○	○	○
We periodically examine our existing business positions and investigate the potential of new partnerships	○	○	○	○	○	○	○
We thoroughly check the benefits from our partnerships before integrating them into our internal operation	○	○	○	○	○	○	○
We collect and share information that provides a context for other members in our network	○	○	○	○	○	○	○
We thoroughly assess the value of relevant knowledge that enters our company before we take action upon it	○	○	○	○	○	○	○
We critically and openly review the benefits of our partnerships and their returns before making a decision to continue developing a new relationship	○	○	○	○	○	○	○
We emphasize effective coordination among different functional areas in our firm	○	○	○	○	○	○	○

	1	2	3	4	5	6	7
We require a great deal of factual information to support day-to-day decision making	○	○	○	○	○	○	○
We tend to be highly analytical in our decision making processes	○	○	○	○	○	○	○
We use several planning techniques	○	○	○	○	○	○	○
We use the outputs of management information and control systems	○	○	○	○	○	○	○
We commonly use manpower planning and performance appraisal of senior managers	○	○	○	○	○	○	○
We avoid excessive dependence on other members of the network	○	○	○	○	○	○	○
We develop generic assets to increase the scope of our business network	○	○	○	○	○	○	○
In general, our mode of operations is riskier than that of our competitors'	○	○	○	○	○	○	○
We adopt a (rather) conservative view when making major decisions	○	○	○	○	○	○	○
Our business operations generally follow 'tried and true' paths	○	○	○	○	○	○	○
We tend to be risk-averse	○	○	○	○	○	○	○

Thank you for your participation!

Summary

Understanding the variance in firm performance has been an important topic in the strategic management literature. In the last two decades it has become particularly interesting as business networks increasingly have become an integrated part of a firm's environment. Besides the internal resources, the less-controlled external resources in the firm's business networks to affect its performance too. The uncertainty associated with the lower levels of control over external resources implies that there is room for strategic actions as a moderator to obtain better firm performance.

This study investigates the following research question: *What are the roles of internal and external resources, and strategic actions in business networks, and what is their relationship with firm performance?* We propose a conceptual framework that adopts an integrated view to study firm performance in an environment where firms become increasingly interconnected. It combines the Resource-based View (RBV), which predominantly looks at a firm's internal resources as a source of competitive advantage as well as the network perspective, which emphasizes the resources inherent in a firm's business network as a source of competitive advantage.

This thesis starts with the notion that a firm is an autonomous entity operating in an environment and aiming for improving its performance. Following the RBV, a firm owns inherently unique resources that differentiate it from other firms. When these resources are valuable, rare, inimitable, and non-substitutable (VRIN), they become sources of sustained competitive advantage and firm performance. In addition, firms are also economic agents that depend on other members in a business network and require complementary resources from their partners. They consciously act and react to threats and opportunities in their business network. These opportunities or threats, either from collaborators or competitors, affect a firm's competitive advantage. Therefore, we propose a conceptual framework of strategic actions that acts as a mechanism to enhance and protect a firm's VRIN conditions and sustain firm performance.

The research starts with a literature review and develops a conceptual model. The conceptual model takes into account a firm's internal resources, external resources and strategic actions as three important factors influencing firm performance. This is followed by an empirical study in Chapter 3 to examine the direct relationships and the interactions between internal or external resources and the influence on firm performance. We conducted a regression analysis on 96 cases of firms that are publicly listed with SIC 7372 and are part of a network of

software industry in 2007. The findings are not as straightforward as expected, and confirm other research, i.e. internal resources, measured by technological and marketing assets, are not consistent and positive explanatory variables of firm performance. External resources, as represented by structural autonomy, directly influence firm performance and the relationship is positive, as expected. The findings also show that the inclusion of a firm's external resources increases the explained variance in firm performance. This raises the question to what extent firm performance is not only dependent on the resources it possesses, as articulated by the RBV and network perspective, but also on their strategic actions in their business networks.

In Chapter 4, we investigate the strategic actions among four (4) firms in the pre-packaged software industry. The case studies indicate that strategic actions do play an important role in the relationship between a firm's resources and its performance. We identified a number of strategic actions and found that firms that perform well, put more emphasis on different strategic actions, compared to firms that perform less. The findings based on the four cases, indicate that strategic actions in the relationship between a firm's resources and performance are important. These strategic actions underline the need to augment the RBV and network perspective with strategic actions that reflect actions that enhance or protect the resources of a firm in order to improve its performance. To better understand the general influence of strategic actions, it is important to develop an instrument to measure a firm's strategic actions in a business network.

In an earlier study, Venkatraman developed a model of six dimensions that reflect strategic actions and we extend this model with a network perspective on strategy. We tested the questionnaire using 54 responses we received from a survey conducted in the Dutch IT-software industry. The results indicate that there are distinct dimensions reflecting the firm's strategic orientation toward its partners, in terms of managing efficiency, dependence and tensions when collaborating and competing in a business network.

Because a firm's business network consists of complex and multifaceted phenomena, it requires a variety of concepts to understand the role of strategic actions in it. The first contribution of this study is that we extend the RBV with the network perspective to explicitly take into account a firm's external resources as factors influencing firm performance. The second contribution refers to the inclusion of firm strategic actions as an instrument to enhance and protect the VRIN conditions of a firm's resources. Strategic actions seem to be an important set of variables that so far has been overlooked, while it is important when it comes to realizing the full potential of a firm's resources. Internal resources, external resources and strategic actions are all important in explaining firm

performance. These findings allow us to complement the main causal mechanism of RBV, i.e. that firm resources are a source of sustained competitive advantage, with the influence of strategic actions to enhance and safeguard sustained competitive advantage. Our third contribution is the creation and initial testing of a tool to measure strategic orientation that explicitly includes network-related strategy and captures a firm's emphases on various strategic dimensions.

We underline the importance of the match between a firm's resources and strategic actions in improving its performance. Being connected in a business network, a firm's strategy may not be categorized in one strategy dimension, but it is a multi-dimensional set of actions that reinforce each other to capture the benefits, reduce the costs, and manage the risks. Firms like SAP or Autodesk capitalize their internal and partners' resources and showed proactive and visionary strategic actions that enabled them to move ahead of their competitors and to enjoy the benefits of early commitment to technology development. They were also able to engage in defensive and analytical strategic actions that enabled them to maintain or improve their efficiency. They also took some aggressive strategic actions that enabled them to maintain their independency with regard to both their competitors and collaborators. Firms may put different emphases on the various strategic dimensions which allow them to orchestrate strategic actions and balance the forces that it faces in its external business network.

From managerial point of view, this research provides some thoughts about a firm's strategy in a business network. Having an integrated and coherent strategy shows the manager's ability to balance the benefits and the threats embedded in a firms' business network. There are three main building blocks which provide questions to guide managers in diagnosing and evaluating the breadth and coherence of their strategy, which ultimately influences firm performance. These three building blocks are (1) identifying a firm's resource positions, (2) aligning resources and strategic actions, and (3) evaluating the strategic actions firms can employ in a business network.

Samenvatting

Het onderzoek in strategisch management is voornamelijk gericht op het begrijpen van de variantie in de prestaties van ondernemingen. In de laatste twee decennia, is de rol van bedrijfsmiddelen in business netwerken steeds sterker geworden en wordt in toenemende mate gezien als een geïntegreerd onderdeel van een onderneming. Naast de interne middelen, hebben de voor een bedrijf minder goed te controleren externe bedrijfsmiddelen in business netwerken dus eveneens een sterke invloed op de ondernemingsprestaties. Maar de onzekerheid van externe middelen die voortkomt doordat er minder controle over is, betekent dat de strategische acties die een onderneming neemt een belangrijke invloed hebben op de uiteindelijke ondernemingsprestatie.

In deze studie staat de volgende onderzoeksvraag centraal: Wat is de invloed van de interne en externe bedrijfsmiddelen op de prestaties van een onderneming en welke rol spelen strategische acties daarin? Aan de hand van een conceptueel raamwerk analyseren wij de prestaties van ondernemingen waarbij naast de interne en externe bedrijfsmiddelen ook de strategische acties worden meegenomen. Het raamwerk combineert de Resource-based view (RBV), die voornamelijk uitgaat van de interne middelen van een onderneming als bron voor het verkrijgen van een concurrentievoordeel, alsmede het netwerk perspectief, dat ingaat op de bedrijfsmiddelen die beschikbaar zijn in het business netwerk van een onderneming.

Dit proefschrift begint met de gedachte dat een onderneming een autonome entiteit is en streeft naar verbetering van zijn prestaties. De RBV veronderstelt dat een onderneming kan bestaan en zijn prestatie ontleend aan het hebben van unieke bedrijfsmiddelen waarmee het zich kan onderscheiden van haar concurrenten. Wanneer deze bedrijfsmiddelen waardevol, zeldzaam, lastig te kopiëren, en niet-substitueerbaar (VRIN) zijn, dan worden ze geacht een bron te zijn van een duurzaam concurrentievoordeel en uiteindelijk de bedrijfsprestaties. Echter, ondernemingen opereren niet volledig autonoom en zijn ook afhankelijk van andere ondernemingen in een business netwerk; ze gebruiken vaak de complementaire bedrijfsmiddelen van hun partners. Bovendien handelen en reageren ze bewust op bedreigingen en kansen die voortkomen uit hun business netwerk. Deze kansen of bedreigingen, zowel van partnerbedrijven als ook van concurrenten, kunnen het concurrentievoordeel van een onderneming beïnvloeden. Daarom nemen wij in ons conceptueel raamwerk de strategische acties op die ondernemingen nemen om de bestaande set van bedrijfsmiddelen te verbeteren of te beschermen en daarmee de prestatie van een onderneming kunnen behouden of verbeteren.

Het huidige onderzoek begint met een literatuurstudie en ontwikkelt een conceptueel model. Het conceptuele model houdt rekening met interne en externe middelen van een bedrijf en de strategische acties die de belangrijke factoren vormen voor de verklaring van de prestaties van bedrijven. Dit wordt gevolgd door een empirische studie in hoofdstuk 3. In deze empirische studie worden de directe effecten van interne en externe bedrijfsmiddelen op bedrijfsprestaties onderzocht en de interacties tussen interne en externe bedrijfsmiddelen. Een regressieanalyse met 96 beursgenoteerde software bedrijven met de industriecode SIC 7372 geeft niet een eenduidig beeld. Het bevestigt eerder onderzoek dat het effect van interne middelen, gemeten aan de hand van technologische en marketing assets, niet altijd een positief effect hebben op de bedrijfsprestaties. De externe bedrijfsmiddelen hebben echter wel, zoals ook verwacht door de netwerk theorie, een direct en positief effect op de prestaties van een onderneming. De analyse toont tevens aan dat door het opnemen van de externe bedrijfsmiddelen van een onderneming de verklaring van de variantie in prestatie toeneemt. Aan de hand van deze analyse lijkt het erop dat de prestatie van een bedrijf niet alleen afhankelijk is van de middelen die een onderneming zelf bezit of waar ze toegang tot heeft via haar business netwerk zoals verondersteld wordt door de RBV en het netwerk perspectief, maar ook dat strategische acties een belangrijke kunnen spelen.

In hoofdstuk 4 onderzoeken we de strategische acties van vier (4) bedrijven in de pre-packaged software-industrie. De case studies laten zien dat strategische acties een belangrijke rol spelen in de relatie tussen de bedrijfsmiddelen van een onderneming en haar prestaties. Ondernemingen die goed presteren leggen nadruk op andere strategische acties in vergelijking met ondernemingen die minder goed presteren. Deze bevinding onderschrijft de noodzaak om de RBV en het netwerk perspectief uit te breiden met strategische acties die een proactieve aanpak of een beschermende handeling beschrijven zodat de bedrijfsmiddelen van een onderneming beter bijdragen aan de prestatie van een onderneming. Om de invloed van strategische acties beter te begrijpen, is het belangrijk om een instrument te ontwikkelen dat de strategische acties van een onderneming in een business netwerk kan meten.

In een eerdere onderzoek heeft Venkatraman een model met zes dimensies voor strategische acties ontwikkeld en deze vullen we aan met strategische acties in een business netwerk. De vragenlijst hebben we getest in een groep van 54 ondernemingen in de Nederlandse IT-software industrie. De resultaten geven aan dat er verschillende dimensies zijn die de oriëntatie van een onderneming ten opzichte van haar partners, op het gebied van het beheer van de efficiëntie, de afhankelijkheid en de spanning in samenwerking met partners weerspiegelen.

Omdat een business-netwerk van een onderneming een complex en veelzijdig fenomeen is, vereist het een verscheidenheid aan concepten om de rol van strategische acties in business netwerken te begrijpen. De eerste bijdrage van deze studie is dat we de RBV uitbreiden met het netwerk perspectief en zo rekening houden met de externe bedrijfsmiddelen van een onderneming die haar prestatie kunnen beïnvloeden. De tweede bijdrage betreft de rol van strategische acties van een onderneming als een instrument om de VRIN voorwaarden van de bedrijfsmiddelen te versterken of te beschermen. Strategische acties lijken een belangrijke set van variabelen die tot dusver over het hoofd zijn gezien terwijl zij belangrijk is als het gaat om het realiseren van het volledige potentieel van de bedrijfsmiddelen van een onderneming. De interne en externe bedrijfsmiddelen en de strategische acties zijn allemaal belangrijk bedrijfsprestaties te kunnen verklaren. Deze bevindingen stellen ons in staat om het belangrijke causale verband van de RBV, d.w.z. de rol van bedrijfsmiddelen als een bron van duurzaam concurrentievoordeel, aan te vullen met de invloed die strategische acties hebben op de bedrijfsmiddelen om zo het duurzame concurrentievoordeel te verbeteren en of te behouden. Onze derde bijdrage is het ontwikkelen en het testen van een instrument dat de strategische oriëntatie van een onderneming in een business netwerk omgeving meet en kwantificeert op een aantal strategische dimensies.

Wij benadrukken het belang om strategische acties af te stemmen met de bedrijfsmiddelen van een bedrijf om zo de prestaties van het onderneming te verbeteren. Wanneer een onderneming opereert in een business netwerk, dan is er niet sprake van een enkele strategie maar is strategie een set van acties die elkaar onderling versterken om voordelen te creëren, kosten te verlagen, en risico's te beheersen. Ondernemingen zoals SAP en Autodesk hebben een voordeel weten te behalen op basis van hun interne bedrijfsmiddelen en die van hun partners door middel van proactieve en visionaire strategische acties die hen in staat stellen om concurrenten voor te zijn en voordeel te genieten van vroege betrokkenheid bij technologische ontwikkelingen. Ze waren ook in staat om via defensieve en analytische strategische acties hun efficiëntie te verbeteren. Ook door meer agressieve strategische acties konden de ondernemingen hun onafhankelijkheid behouden met betrekking tot zowel hun concurrenten als hun partners. Ondernemingen kunnen verschillende accenten leggen op de diverse strategische dimensies waardoor ze de set van strategische acties kunnen afstemmen en zo een balans vinden in de reactie op de krachten die ze ondervinden in het business netwerk.

Vanuit een management perspectief biedt dit onderzoek een aantal gedachten over de strategie van een onderneming in een business netwerk. Door het hebben van een geïntegreerde en coherente strategie kan een manager een afstemming

realiseren tussen de voordelen en bedreigingen die zich voordoen in het business netwerk van het onderneming. Er zijn drie belangrijke bouwstenen die richting geven aan de vragen die managers zich kunnen stellen om een diagnose en evaluatie te maken van de scope en samenhang van hun strategie, en die uiteindelijk van invloed is op de prestaties van het bedrijf. Deze drie bouwstenen zijn: (1) het identificeren van de belangrijke bedrijfsmiddelen van een onderneming, (2) afstemmen van bedrijfsmiddelen en strategische acties, en (3) het evalueren van de strategische acties die ondernemingen kunnen inzetten in een business network.

Acknowledgement

Ghandi once said that “Whatever you do will be insignificant, but it is very important that you do it”. Producing this book signifies a journey that pushes me to give all that I can into what I love to do, doing research. It is a journey that brings me to a stepping stone where I stand now. This book is also a façade of a network of ideas, insights, hard works, and relentless supports of many individuals that I came across up to this point. For these reasons, I am grateful to all of individuals who in many ways have touched, inspired, trained, taught me, provided me with multiple supports and, especially, be there for me.

First of all, I would like to thank my *promotor* Prof. dr. C.P van Beers for giving me an opportunity to continue and finish my PhD research and for your valuable comments and criticisms. I would like to thank my *co-promotor* dr. V.E. Scholten. Your thoughtful comments and guidance have sharpened the focus of this book. I would also like to thank for your calmness that are very important in some critical points during the process. Most of all, I would like to convey my special thanks to dr. Erik den Hartigh and dr. Marc Zegveld who initiated and laid the foundation of this PhD research. Dear Erik, without your continued encouragements, thoughtful guidance, and friendships, this PhD and this book could not have been completed. From you I learnt academic curiosity, dedication and patience. Dear Marc, thank you for your relentless supports and friendship. From you I learnt discipline, decisiveness and care. I also would like to thank all members of my examination committee, Prof. Wim Dik, Prof. Dolfsma, Prof. Bossink, Prof. Trott and Prof. Brazier. Your contributions on this are highly appreciated.

During my stay in the Netherlands, I met friends and colleagues whom I should grateful for. I would like to thank Claire Stolwijk and Marian Bosch-Rekveld. Thank you for your supports and the long talks we had in different occasions especially during our dinners. Dear Claire, from you I learnt positivity and kindness. From Marian, I learnt about balancing different aspects of academic and personal life. I hope you know that both of you are one big part of the stories behind this book. I would also like to thank El van Arkesteijn, your on-hand and quiet supports have helped me a lot. I also would like to thank Miranda Aldham-Breary for your assistance with English and most importantly your friendship. I also would like to thank Paul Plaatsman, Carla C. van den Berg, Mas Kojek, and Ronald with your help on my data collections.

To my colleagues at TU Delft, Roland Ortt, Herman Mooi, Zenlin Kwee, Danny Soetanto, M Soeprapto, Prof. Alfred Kleinknecht, Robert Vergeer, Fernao Beenkens, Helen Keasberry, Jafar Razaei, Gerteen van Der Kaa, Sergey Filippov, Fardad Zand, Mozdekh Taheri, Casper Wassink, Patrick van der Duin, Servaas

Storm, Ronald Dekker, Dap Hartman, Rossitza Rousseva, Adriana Diaz Ariaz, Claudia Werker and Zofia Lukszo thank you for our time together. All of you bring different colours to this book and me. I would like to thank my friend and colleagues in the department of Agro-industrial Technology, Indonesia. Thank you for the works, interesting projects and discussions, laughter, motivation, and supports. They are very much needed to bring me to this point. I would also like to express my appreciation to the Indonesian community in the Netherlands, especially to tante Mimi Herwani, Shaista Ima, Siska & Archie, Pita & Saputra, friends in *kelompok ngumpul ngaji,* friends in Delft and Den Haag. I also would like to thank friends in different parts of the world for sharing our stories and motivating each other.

Last but not least, I would like to thank my family. To Ardra, to whom I dedicated this book for, I would like to thank you. This book is not a book that you usually read, yet, it contains so many stories between you and I that I would like to cherish and remember. To Agus, my late sister Ulin, Dian, Roni, Mas Bambang, Sofan, my nieces and nephews, thank you for being you. The years that we have spent together have fascinated and perplexed me that make me feel much more purposeful in living my life. I would like to thank my father and mother for everything that you have given me. The way you live your live has taught me the importance of perseverance, grateful and courage. All of these I still have yet to continuously master.

In the end, I would like to say that the journey does not end at this point. It is one stepping stone to a new journey and I will remember one important lesson I got from this journey. Resources are a mere potentiality, it is the way I act and conduct myself to live up to the opportunity that come across my path that will bring me to the next stepping stone.

Bogor, November 2014

Curriculum Vitae

Elisa Anggraeni was born on November 26, 1974 in Yogyakarta, Indonesia. She studied at SMAN 3 in Yogyakarta and graduated in 1992. She continued her study at Gadjah Mada University and received its bachelor degree in Agro-industrial Technology. After graduating from Gadjah Mada University in 1997, she began to work as a faculty member at the Department of Agroindustrial Technology in the section of Industrial Engineering and Management, Bogor Agricultural Universtiy (IPB) in 1998. She received STUNED scholarship to study at Delft University of Technology in 2001 and received her master of science from Faculty of Technology, Policy and Analysis in 2003. Following her graduation she continued working at Bogor Agricultural University.

Prior to starting her PhD research in 2007, she was assigned to the office of Intellectual Property Right, involved on designing instruments, research related to national innovation system, and the set-up of RAMP IPB (Recognition and Mentoring Program), a partnership between IPB and The Lemelson Foundation (USA) to nurture and educate university students in invention and technology-based entrepreneurship, and facilitate the growth of technology-based entrepreneurship through courses and facilitations in universities across Indonesia. As of 2011, she did her PhD research part time from Indonesia. While working on her PhD research, she continued to work at IPB and got involved in setting a double degree program with the University of Adelaide that was started in 2013. She also continued to work at RAMP IPB. She designed and manages the living lab program for sustainable food chain that provide an open innovation platform that connects students, faculties, entrepreneurs and communities to bring technological innovation into sustainable solutions through co-creation and their socio-economic deliveries.