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**SUPPLY CHAIN COLLABORATION AND OPEN
INNOVATION: TOWARD A NEW FRAMEWORK
FOR NETWORK DYNAMIC INNOVATION
CAPABILITIES**

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1. Introduction

Supply chain management (SCM) has been called the company's ultimate core capability and the enabler of winning business models (Fine, 1998). As part of a well-designed competitive strategy, supply chain management is “the integration of key business processes from end user through original suppliers that provides products, services, and information that adds value for customers and other stakeholders” (Lambert et al., 1998) and can drive profitability by improved customer service and satisfaction (Hendricks and Singhal, 2003) and reducing costs (Hult et al., 2004; Lee, 2004).

Frohlich and Westbrook, 2002 divided such integration into supply and demand integration. According to Handfield (1993), this social coordination was facilitated by the diffused policy of the reduction in the supply base, combined with information sharing (including, but not limited to, demand information). In the last decade, these policies have been carried on as ways to reduce the costs of the purchasing process and its complexity, as well. In recent years, other authors (Monczka and Trent, 2005) observed that many companies in 1990s were dramatically reducing the number of suppliers in their portfolio. Having improved their own internal processes, the opportunity to create a competitive advantage relied on the improvement of the external relationships among the supply chain, and in particular, with suppliers.

Supply chain management and relationship marketing research has attempted to increase understanding of the conditions for win-win partnerships, i.e. customer-supplier relationships in which close long-term co-operation simultaneously increases the value produced by the demand chain and decreases the overall cost of the chain (Moody, 1993; Vollmann et al., 1995; Lambert et al., 1996; Cooper et al., 1997; Friis Olsen and Ellram, 1997; Bensaou, 1999). While true strategic partnerships create new value, they are costly to develop, nurture and maintain. Also, they are risky given the specialized investments they require (Cooper et al., 1997; Bensaou, 1999).

Yet, they require a stronger integration along the supply chain, in order to get the maximum benefit from the leveraging on the suppliers' competencies.

Particularly in the case of innovation, the ability of both reading the market signals correctly and quickly reacting during the product's life cycle call for effective integration along the whole demand chain. As a consequence, suppliers must be chosen for their competencies, speed and flexibility and only for their low cost (Fisher, 1997).

In addition, the increasing complexity of technological and product development, the rapid rate of product obsolescence, and the need to gain rapid access to markets have strengthened the motive for collaborative product developments (Kent, 1991).

Lawton Smith et al. (1991) suggest that interfirm collaboration is motivated by technological gain for participating firms (particularly when there is a need to work on the next generation of technology, where future success depends on technological leadership). These benefits of collaboration are supported by Yoshino and Rangan (1995) "alliances permit firms to react swiftly to market needs; as time based competition becomes more important, the role of alliances in managing the time element becomes critical". An overwhelming reason for firms entering into collaborative relationships is to reduce and share product development risks and costs.

This study aims to understand which are the factors that allow a company to be proactive in a collaborative relationship within its supply chain (and network). The focus of the analysis will be on the innovation process and its points of contact with different players outside the company.

Intense competition, more exigent and unpredictable demand, shortened product life cycles, continuous improvement in technology, more complex products, force companies to structure their processes focusing on their core competences, selecting on the external market complementary competences that could help them to maintain their competitive position.

In Operation studies, collaboration with their upstream and downstream supply chain partners becomes a necessity in order to increase asset returns (Togar and Ramaswami, 2004). Nowadays, firms compete for market presence through their entire supply chain against the supply chains of their competitors (Boyaci and Gallego, 2004; Corbett and Karmarkar, 2001).

In R&D and Innovation management literature, collaboration refers to new model of leveraging from external sources of ideas, technology or channels to develop or introduce a new product or service or create new business models.

The study aims to illustrate which are the key factors, organizational models and main criticalities in implementing a collaboration strategy in order to improve the productivity of the innovation process of a company, leveraging on external sources of competences and aligning its supply chain in order to sustain its innovativeness rate required in highly competitive environment.

2. The relevance of collaboration in Supply Chain Management

2.1 Supply Chain Management collaboration: a literature review

The Supply Chain is the network of organizations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of product and services in the hands of the ultimate consumer.

Supply Chain Management is also defined as “the integration of business processes from the user through original suppliers that provide products, services and information that add value for customers and stakeholders” (Cooper, Lambert and Pagh, 1977, formalized by The International Centre for Competitive Excellence, University of North Florida, 1994)

The central idea of Supply chain management (SCM) is to apply a total system approach to managing the flow of information, materials, and services from raw materials suppliers, through factories and warehouses, to the end customers, in order to create a higher value compared to competitors supply chain. Successful Supply Chain Management requires cross-functional integration of key business processes within the firm and across the network of firms that comprise the supply chain.

Among others, there are a number of factors moving the competition from single companies to supply chain and supply networks: increasing competition, dynamic systems with variability both in demand and supply, higher complexity of new products and, consequently, the need of a higher number of deeper competences required to better serve the customer (both in business to business markets and in business to consumer industry).

Relationships among the supply chain are defined in different ways, but, for this study, the possible forms between the two extremes described as an arms-length relationship and a partnership will be considered. In a dyadic relationship, for example, we can define four major categories (Trent, 2005).

The first type is the counterproductive relationship (also called antagonistic, lose-lose or arms-length relationships): it is based on a lose-lose strategy and, although intuitively not recommended, it might occur in some cases. Parties play against each other's interest, for example when buyers take legal action against their suppliers to prevent material-price increases that the buyer contends violate contractual agreements. This relationship typically arises when the transaction has not a long-term horizon, purchase could be either occasional or repetitive, but in the second case usually related to commodities or goods easy to find on the market that allows the players to behave one against the other.

A relationship could be healthy competitive (also defined as distributive, win-lose, or adversarial relationships) when suppliers are continuously evaluated on the basis of the competitiveness of their offer (price, quality, service). The relationship does not create new value along the supply chain, but buyers and suppliers act in order to capture a larger share of the existing value in their self-interest. This practice is common for lower value items (or service) with low supplier-switching cost and usually based on competitive bidding or price comparisons, shorter-term contracting, regular market testing, and reverse Internet auctions. Usually the portion of the total spending based on this relation should not be very high.

Cooperative and collaborative relations represent interesting opportunities for companies to better respond to the ever changing need of the final markets, in terms of higher quality, decreasing costs and shortened lead time. The relationship is defined cooperative when it is based on a mutual win-win closer interaction and a wider sharing of information (based for example on an open book contracts). It is usually intended to be a long-term relation, requiring a longer initial agreement and familiarization period. Each part can contribute to increase the value created for both parties.

A collaborative relationship broadens the process involved in the interaction, and aims to find a shared solution to compete on the market. It is reserved to a limited number of strategic suppliers that provide goods or service that contribute to the company's competitiveness.

Almost every industry is facing changes that make suppliers a critical part of a firm's value chain (Trent, 2005).

Collaboration in the context of supply chain management is a broad term that needs to be clarified. The terms emerged in the form of Collaborative Planning Forecasting and Replenishment (CPFR) (VICS, 2004). Less advanced forms of customer collaboration were practiced through Vendor Managed Inventory (VMI) and Continuous Replenishment programs (CRP) (Ireland and Bruce, 2000; Barratt, 2002) and of supplier collaboration through the collaborative planning (CP) and the Supplier Managed Inventory (SMI)

Supply chain collaboration in this study is defined here as the ability to work across organizational boundaries to build and manage unique value-added processes to better meet customer needs. Supply chain collaboration involves the sharing of resources in formation, people, and technology - among supply chain members to create synergies for competitive advantage. Collaboration goes beyond managing transactions for efficiency to managing relationships for creativity and continuous improvement (Stanley E. Fawcett, Gregory M. Magnan, Matthew W. McCarter, 2008).

Furthermore, Supplier Relationship Management (SRM) is a broad-based management methodology that underlines how important are the relationships between a company and its suppliers' base. A relationship with suppliers based on the principles of massive collaboration and partnership derives more from a strategic philosophy than from simple portfolio management assessments. However, the costs required to develop, strengthen and maintain a strategy partnership with a supplier are often very high and need a specific selection criteria that go beyond the traditional operational dimensions (Baglieri and Zamboni, 2005).

Thus, supply chain management becomes the management of the "new extended firm" (Dyer, 1996; Post, Preston and Sachs, 2002). An extended enterprise is a group of individual organizations brought together under a joint strategic purpose (Doz and Hamel, 1998). The strategic fit between these companies is defined on the basis of their core competences (Prahalad and Doz, 1991) and may result in a competitive or cooperative (collaborative) situation.

2.2 The need for new competencies

In the resource-based view (RBV) theory (Barney, 1991; Grant, 1991; Wernerfelt, 1984) companies' competitiveness was defined by their distinctive resources, mainly static and well-defined for a long-term perspective (i.e. they will be sustainable). Barney (1991) highlighted the necessity of such resources to be valuable, rare, inimitable and non-substitutable (VRIN). The ability of firms to assemble, integrate, develop, improve such resources defined the concept of company (still static) capability (Grant, 1991; Miller, 2003; Ray et al., 2004).

Some authors discussed the inappropriateness of this approach in a highly dynamic and changing environment (Winter, 2003; Barney et al., 2001; Eisenhardt and Martin, 2000; Teece et al., 1997) that characterizes the last decades, compared to the stable environment in which RBV was conceived. They states that capabilities need to continuously change, becoming dynamic, in order to refresh or develop new sustainable and distinctive capabilities over time. This dynamic view considers continuous improvement for short-term results as the unique way companies can create their temporary advantage (Helfat and Peteraf, 2003; Verona and Ravasi, 2003; Teece et al., 1997). Developing effective dynamic capabilities allows company to perform better than competitors and to achieve and maintain a long-term competitive advantage (Eisenhardt and Martin, 2000; Teece et al., 1997)¹. Hence static capabilities are not self-sustaining over the long-run without dynamic capabilities that reshape the improved or entirely new capabilities.

Furthermore, recent research has shown companies develop both internal and external (e.g. cross-organizational) capabilities (Gibson et al., 2009; Defee and Fugate, 2010).

¹ Dynamic capabilities were also defined as “a learned and stable pattern of activities through which the organization systematically generates new static capabilities and/or modifies existing capabilities” (Zollo and Winter, 2002).

As the focus shifts from single firm resources and capabilities to its supply chain, it comes to including multiple companies. In this view, realizing new cross-organizational supply chain capabilities becomes the new challenge to compete through a more responsive, adaptive, agile and better performing supply chain.

2.3 Supply chain collaboration and cross-organizational enhanced capabilities

In a globally competitive, constantly changing environment static capabilities as described above are not only weak weapons to maintain the competitive advantage but also refers to a single company. As the relationships among companies evolved and created a more interconnected structure, static and company-level competencies are not even more sufficient to create and explain a competitive position of a firm.

Collaboration and supply chain focus require a broader spectrum of analysis. Defee and Fugate, 2010) conceptualize the Dynamic Supply Chain Capabilities (DSCCs) and highlight the importance of the strategic approach to nurture, develop, and continuously innovate these new extended dynamic competencies. “While dynamic capabilities are firm-centric, DSCCs are embedded within the collaborative routines formed between multiple supply chain partners. Thus, multiple partners may jointly develop and use DSCCs to reenergize and update existing (static) capabilities or form entirely new capabilities.” (Defee and Fugate, 2010).

Companies that embrace this new strategic approach are supply chain oriented and opened to learn from the partners. This does not mean that they have to identify external competencies that create the competitive advantage of the companies that possess them and try to acquire or internally develop them in order to replicate the competitive advantage and reduce the “knowledge gap”.

There are a number of reasons justifying this. First of all, it is very difficult to excel in all the capabilities embedded in an extended organization as the supply chain is, and even worst, these capabilities are distributed in a supply network. It is too costly to develop

all of them, it requires too many resources and the more the company increases its asset capabilities the more it reduces its flexibility, which is useful, for instance, to address rapid changes in its strategic orientation.

Secondly a dynamic, non imitable, sustainable capability is usually path dependent and developed over time through the accumulation of experiences. It has been developed along a learning curve that is difficult to imitate in short time. It may be embedded in a tacit knowledge, that is difficult or impossible to articulate and formalize, and takes time to learn (Leroy and Ramanantsoa, 1997; Polanyi, 1968)

Finally, replicating or internally acquiring the partners' capabilities is unnecessary once the company is able to access such knowledge and to obtain the possibility of correctly exploiting it without possessing it directly. From a supply chain point of view, copying and internalizing a distinctive capability already possessed by a partner is redundant, reducing the overall efficiency of the inter-organizational relationship (Hamel, 1991; Levin and Cross, 2004; Pedersen et al., 2008).

Hence, the real competence that needs to be developed nowadays is the capability to interact with external partners, which requires a cultural orientation to collaboration and openness, or "learning orientation", as defined by Defee and Fugate (2010). The firm centric view of learning could reduce the potentiality learning from and through the supply chain members. The inter-organizational learning process proposed by the two authors does not require all supply chain members to absorb the knowledge possessed by other members, but it requires firms to look beyond their own boundaries and view the larger supply chain holistically (Holmberg, 2000).

Starting from the model proposed by Defee and Fugate (2010) described below, the next step of the research is to analyze in depth which are the enabling factors of (and the barriers to) a collaborative relationships with external supply chain partners.

As cultural antecedents to collaboration, the model suggests a company strategic supply chain orientation combined with a learning capability. Both are influenced by the turbulence of the competitive environment that forces companies to experiment new solutions in order to maintain their competitive advantage and their static or already

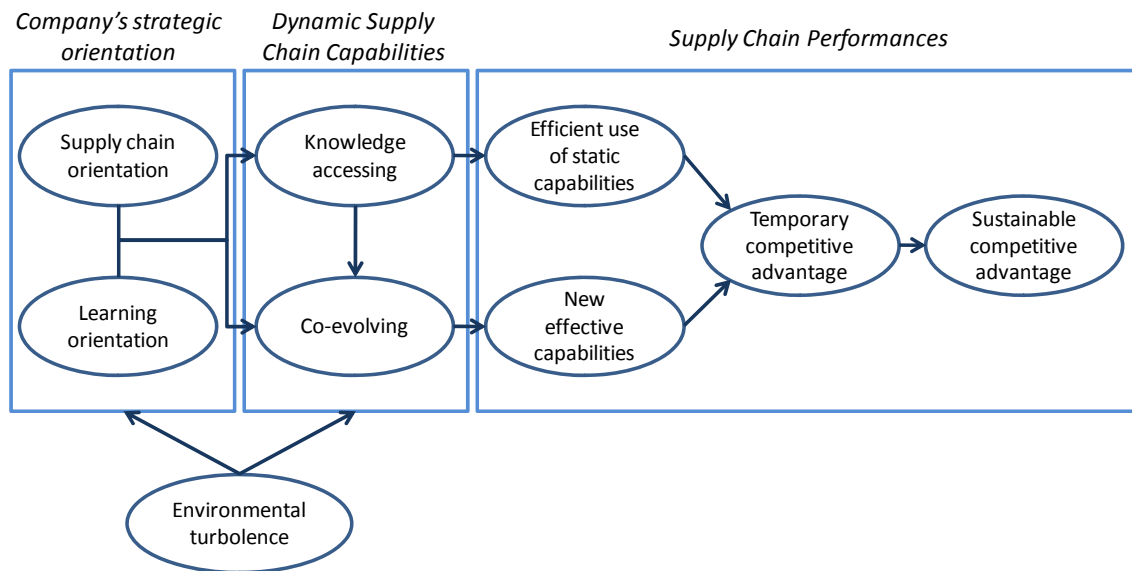
dynamic capabilities up to date. The need to change and the propensity to improvise and experiment increase when the competition becomes fiercer (Moorman and Miner, 1998).

Adopting a Supply Chain Orientation means to recognize and avoid redundancies in the supply chain (Min and Mentzer, 2004) and instead to utilize the existing resources of each supply chain partner, thus facilitating knowledge-accessing routines between supply chain members. To act this way, firms have to build and maintain trust, commitment, cooperative norms, dependence, organizational compatibility, and top management support, just to mention some of the several behavioral elements that allows relationships to be collaborative and effective (Mentzer, 2004). For a detailed analysis of these behavioral and procedural elements see also chapter 2.4 (p. 15).

On the other side a learning organization is characterized by the propensity of the firm to create and use knowledge, by a strong commitment to learning, open mindedness, and a propensity to share its vision with others (Sinkula et al., 1997).

Therefore, in order to efficiently use the capabilities already existent among the supply chain players, firms should not replicate or internally develop the capabilities already available on the market but invest on new “dynamic supply chain capabilities”, as the capability to scan and create a contact point with external knowledge (knowledge accessing) and the capability to transform its static and dynamic capabilities in something new, or simply improved, thanks the re-combination of the actual competences with the external sources of knowledge (co-evolving). Indeed, co-evolving was also described as a way of capturing cross-business synergies (Eisenhardt and Galunic, 2000) or “the set of routines businesses use to reconnect webs of collaborations within and across companies to generate new and synergistic capabilities” (Eisenhardt and Martin, 2000). To allow this cross fertilization, supply chain partners should demonstrate awareness of the need to change, and of the perceived capacity to change effectively (Cohen and Levinthal, 1990).

Figure 1. Dynamic supply chain capabilities to enhance supply chain performances



Source: Adapted from Defee and Fugate, 2010

The efficient use of the available knowledge across the companies that constitute a firm supply chain and the formation of new recombined knowledge allow companies to create a new temporary competitive advantage against other supply chains, and remain ahead of the competitors' supply chains. The development of true inter-organizational capabilities - both dynamic and static - requires the management efforts of multiple partnering organizations. Indeed many authors found trust, openness and transparency have a positive effect on innovation, as knowledge sharing is more frequent, richer, and promote the exchange of "private" information (Hamel, 1991; Reagans et al., 2005; Uzzi and Lancaster, 2003).

2.4 Supply chain collaboration enablers and resistors: how to build a collaborative network

Static companies in dynamic systems cannot remain competitive as rivals take advantage of driving forces to change, collaborate, and obtain better performances (Fawcett and Magnan, 2004; Friedman, 2000; Grove, 1996; Lee, 2004).

The development of a new dynamic capability to collaborate with other companies along the supply chain is influenced by external and internal factors.

External factors refer to the dynamic change of the competitive environment as described in previous chapters that entails a change in all industries. Some examples include the phenomenon of economic globalization, the formation of a new stronger organization due to merger and acquisition strategies, the change in the bargaining power of some players along the supply chain, increased customer responsiveness, channel integration and advances in Information and communication technologies (ICT). From the technological perspective, a shorten technology life cycle accompanied by the emergence of latent and disruptive technologies increases the degree of competition within and across different industries. Companies strive to avoid market share losses, face the need to maintain a balanced financial structure (net working capital and return on asset related to operations and supply chain choices) and recognize the need of a managerial change towards the so-called “supply chain oriented” new business model. As in any organizational change, the commitment for an effective collaboration needs to be promoted and sponsored by the top management, be widespread, and be made visible to people throughout the organization.

A more efficient and effective use of the resources along the supply chain, which implies leveraging on external dynamic capabilities spread among the companies that form the supply chain, requires a supportive organizational culture oriented to share information (previously named “learning organization”, open-minded), selecting the right partners with whom to collaborate, invest in trust building and training people to proactively promote and suggest the improvements (or stronger process innovations) required by the external

environmental change (Funk, 1995; Hammer and Champy, 1993; Lawrence and Lorsch, 1967; Stonebraker and Afifi, 2004; Barratt, 2004).

The strategic design of an effective supply chain will bring better performances in terms of cost competitiveness and return on assets, improved financial ratio related to the supply chain, with a faster cash to cash cycle for instance, in terms of delivery time (shorter order cycles), and a superior capability to better serve the market through a flexible customer response, enhanced delivery performance and a better channel relationship.

However, the company propensity to collaborate could be affected by internal resistors, that could be identified at the corporate culture level, related to the behavioral and inter-functional competencies possessed by people involved in these processes, or specifically referred to a particular inter-firm collaboration (Dent and Goldberg, 1999; Kotter, 1995; Barratt, 2004; Moberg et al., 2003; Tyndall et al., 1998).

Any hypothesis of openness to external competencies and external collaboration could be hindered by resistors, both for the acquisition of new knowledge (efficient use of the existing resources) and for the co-evolution of the existing knowledge (collaboration aimed to create new knowledge). Typical resistors are the lack of management support, the lack of trust among decision makers in inter-functional and inter-company processes, and an internal resistance to change the status quo of the company.

The internal analysis of the company readiness to collaborate has to consider the actual capability of its personnel to co-operate and collaborate with other departments or companies. This attitude could be influenced by the company processes, which can be considered as the operating translation of the corporate strategy and culture, even though good processes with unprepared mindset of people do not perform as intended.

Before collaborating with other external entities it is necessary that people (and processes) are able to collaborate internally, sharing information and learning, with cross-functional teams that help to create cross-experienced managers, getting over traditional cross-functional conflicts and turf protection of information and knowledge.

Further, top management has to assure the consistency between the new strategy and the consequent operating policies.

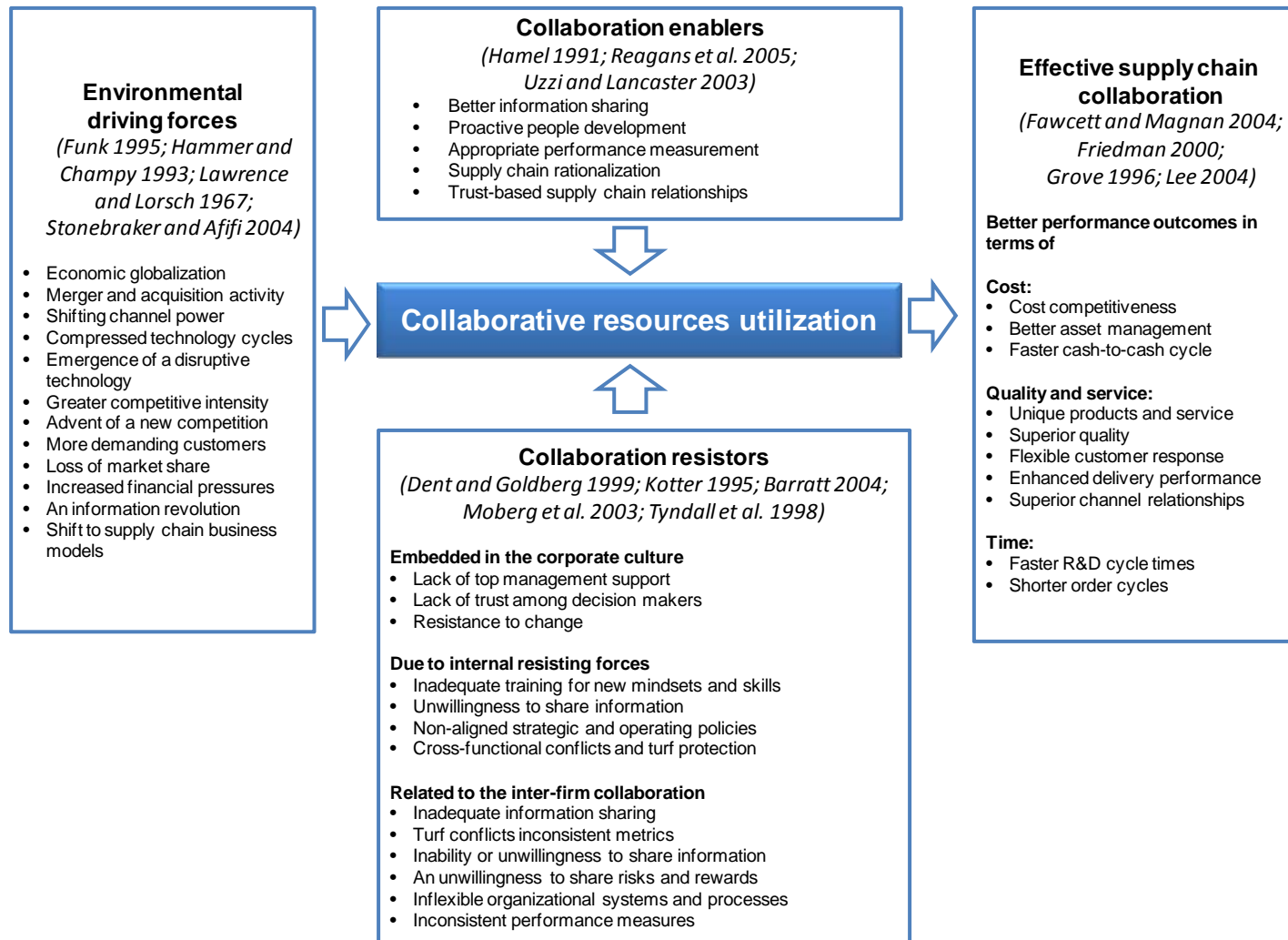
The last category of collaboration resistors refers to the specific inter-firm relationship. Collaboration struggles when strategy, processes, and people are not aligned to the same strategic objective. The effect is an inadequate level of information sharing (because of an unclear objective or effect of a not well defined common strategy), due to the inability or unwillingness to share information, risks and rewards, which usually corresponds to inconsistent performance measurements and metrics.

According to Fawcett, Magnan and McCarter (2008), the evolution towards external collaboration has been defined into three “cultural” states.

In the initial stage companies act individually, and have not yet developed a supply chain orientation strategy. Depending on the current competitive dynamism, they realize that their processes are no more consistent with the external environment and they become conscious of the need of a specific change in their strategy and processes.

The output of this stage is the analysis of the gaps emerging from the comparison between the current situation of the company and the desired state, to cope with the new threats, opportunities or challenges emerged from the external market. In short, they have to “unfreeze” the status quo to renovate or improve their processes to better compete on the market. They need a clear understanding of what customers expect from the supply chain (which are the value-added roles along the supply chain), how the company adds value to the network (mapping its competitive position), and evaluating potential collaboration partners and activities. The awareness of the supply chain strategy, structure and culture brings firms to the transition state, typically a difficult, unsteady, dynamic and potentially lengthy process, in which they must create the right prerequisites for change, such as the appropriate commitment and understanding of the insufficiency of the current situation. This stage requires the removal of the resisting forces for supply chain collaboration, the adoption of a new behavior and cultural approach to collaboration and new practices that support an effective relationship management and trust building. Furthermore, in this phase companies have to review and rethink their supply chain performance measurements, in order to actually encourage and sustain the change, and nurture a continuous improvement in their collaboration capabilities.

Figure 2. Collaborative resource utilization: driver, enablers and resisting forces



At the end of this transformational state companies should have redefined themselves as a clear node with their specific role in an integrated supply chain network, becoming an effective supply chain partner able to influence (or adapt to) the behaviors of others companies along the supply chain. The goal is to design a supply chain network that is dynamic and flexible, to stay relevant and remain a valued member of a better performing supply chain. As supply chain networks evolve companies need to make a periodic environmental, technology and industry scan, find out the best practices and improve collaborative practices through joint problem solving teams and shared technical and managerial resources. When needed, the new state will be revised again and the change process will be retraced.

A recent research based on case studies, highlighted the strategic management initiatives that can facilitate and enhance the collaboration among the supply chain. The results of the best practices and requirements that companies participating to the interviews declared are listed in table 1.

The main pillars can be summed up in:

- a *clear and shared management commitment*, that justify and support the need of change and the consequent modified policies, processes and cultural attitude to work;
- a *clear mapping and role definition of the players* of the considered supply chain, identifying and establishing the ownership of the critical value added processes and core competencies;
- a good practice of accurate and relevant information sharing, integrated among functions and organizations;
- an *appropriate training and development program for people* throughout the organization and the supply chain, in order to form managers able to cope with the complexity of new inter-functional and inter-organizational processes;
- a *proactive and transparent supply chain performance measurement system*, oriented to cooperation and collaboration for continuous improvement;

- an explicit program to qualify and select the right partner and the appropriate form of relationship with each specific supply chain member;
- and, to manage the complexity related to collaborative relationships, a review of the network-supply base aimed to its rationalization and simplification (in terms of members' quantity and items transacted).

Once the company has already faces several typical inhibitors related to the culture, the process or people mindset, it is internally prompt to inter-functionally collaborate and possess the requirements to evolve into inter-company collaboration (see Fig. 3).

Figure 3. The evolutionary path towards supply chain collaboration

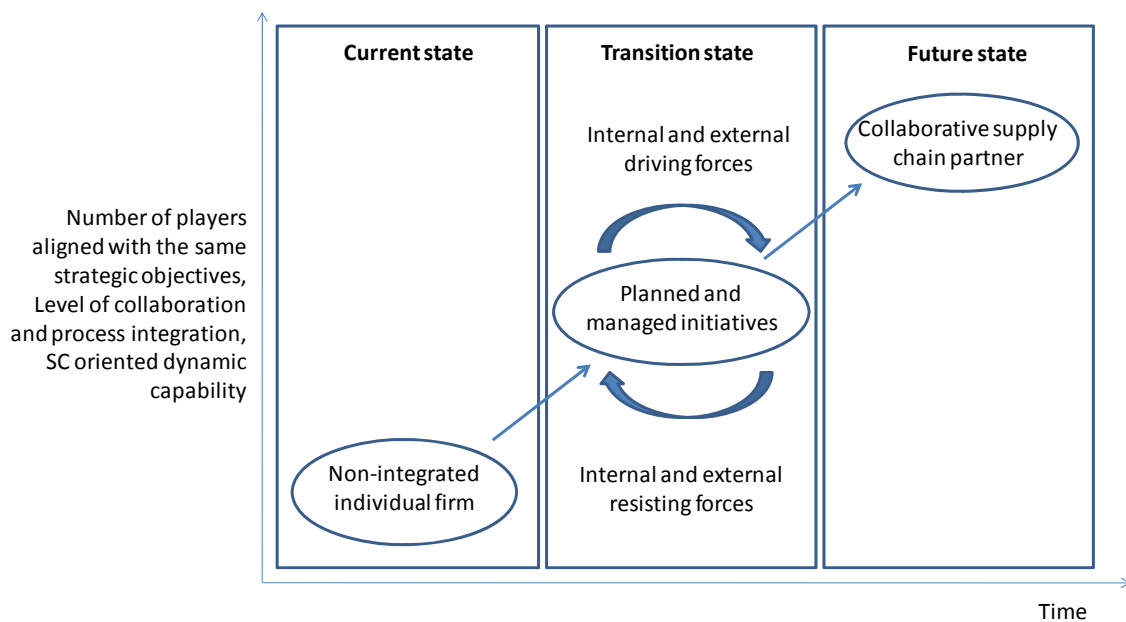


Table 1. Top practices and requirements for supply chain collaboration (in order of importance in each category)

Management commitment	<p>Garner chief executive commitment</p> <p>Make the rationale and need for change/collaboration visible, even palpable</p> <p>Obtain senior functional management support</p>
Supply chain mapping and role definition	<p>Establish common supply chain vision and objectives</p> <p>Define and document business principles, policies, and procedures and map back to value proposition</p> <p>Develop a holistic view via supply chain mapping—organization, process, and technology</p> <p>Identify and establish ownership of critical value-added processes and core competencies</p> <p>Define the specific role(s) of individual supply chain members and aggressively pursue role shifting</p> <p>Determine the supply chain's value proposition</p>
Information sharing and system integration	<p>Established information systems capable of sharing real time accurate and relevant information (connectivity)</p> <p>Inculcate a willingness to share information across functions and between organizations</p> <p>Establish a revenue-tracking system</p> <p>Improve forecast accuracy throughout the entire supply chain</p>
People management and development	<p>Provide supply chain training throughout the organization/supply chain and then hold people accountable</p> <p>Develop mechanisms to share learning throughout the organization and the supply chain</p> <p>Establish cross-functional management and project teams and develop cross-experienced managers</p>
Supply chain performance measurement	<p>Establish performance measures that lead to cooperation/collaboration and create visibility</p> <p>Design a proactive supplier scorecard-based rating system to drive continuous improvement</p>
Relationship management and trust building	<p>Establish a high level of trust within the organization as well as with supply chain partners</p> <p>Find qualified product suppliers and service providers that are committed to continuous improvement</p> <p>Define the appropriate type of relationship to establish with specific supply chain members</p> <p>Establish a supplier development program via process improvement and product development teams</p>
Rationalization and simplification	<p>Identify and take advantage of commonalities and collaborative improvement opportunities</p> <p>Simplify the network-supply base, customer base, and service provider reduction</p> <p>Eliminate unnecessary or slow moving SKUs</p>

Source: Adapted from Fawcett, Stanley E., Magnan, G.M. & McCarter, M.W., 2008

3. Collaborative innovation: from dyadic relationships to networked collaborations

Collaboration with external companies to develop new product and services has been studied by many authors. Research on strategic blocks (Nohria and Garcia Pont, 1991), strategic supplier networks (Jarillo, 1988; Dyer and Singh, 1998), learning in alliances (Doz and Hamel, 1998), interfirm trust (Gulati, 1995; Zaheer and Venkatraman, 1995), and network resources (Gulati, 1999) have examined interfirm relationships from a variety of theoretical perspectives, levels of analysis, and outcomes.

The competition among different supply chains can be extended to the innovation processes. Supply chain management has been also defined as value added chain management, integrated channel management, network sourcing, seamless demand pipeline management, lean chain approach, value stream management, supply chain synchronization and demand pipeline management (Romano and Danese, 2006).

The main advantages of collaboration in innovation and supply chain management processes can be traced in the reduction in product development time and cost (Lewis, 1990; Parker, 2000; Horvath, 2001; McLaren et al., 2000; McCarthy and Golocic, 2002), the increase of market share and asset utilization (Lewis, 1990), the achievement of economies of scale in production, the access to new knowledge and skills, a higher control of the new product development process (Parker H., 2000), a smaller inventory and a rapid access to new markets. Recent empirical work confirms that investments in relation-specific assets are often correlated with better performance compared to more arms-length relationships (Dyer, 1996; Parkhe, 1993). Hence, latest supply chain management and relationship marketing research have attempted to increase understanding of the conditions for win-win partnerships, i.e. customer-supplier relationships in which close long-term co-operation simultaneously increases the value produced by the demand chain and decreases the overall cost of the chain.

The competition is therefore moving from the level of individual firms to the so called “extended manufacturing enterprise” (EME) (Gomes-Casseres, 1994, Rie and

Hoppe, 2001). Individual companies are part of an end-product supply network that competes against other end-product supply network.

Some studies have explored network structure from the perspective of innovation generation (Shan et al., 1994; Podolny and Stuart, 1995; Powell, Koput, and Smith-Doerr, 1996). According to Chapman and Corso (2005) creating value through the effective management of the supply chain on the basis of the daily operations is no longer enough. Companies should collaborate with their respective end-product supply network to innovate too².

The value created in the context of collaboration has been defined into two different perspectives (Martinez, 2003, cited in Bititci et al., 2004):

- the *internal value*, based on the shareholder perspective that consider value as the creation of wealth;
- and the *external value*, in the customer perspective, where value is “customer satisfaction”.

The study of inter-organizational business relationships has been central in theories about Business Networks in the last two decades (Hedaa and Törnroos, 1997; Ford et al., 1998). According to Thorelli (1993) networks are organizational structures between markets and hierarchies. Networks provide a complex paradigm for economic exchange relationships. The opportunities they offer to reduce uncertainty and provide a framework for effective development have attracted considerable interest among business researchers (Axelsson and Easton, 1992).

These research efforts on network theories originate from Scandinavia and have been further developed by the Industrial Marketing and Purchasing (IMP) group whose seminal work on networks dates back to 1982. Some the most noteworthy constructs are the interaction model (Ford, 1997), the ARA (Activity links, Resource ties and Actor bonds)

² In the business model of the future, value chains compete rather than individual companies, and the connectivity and process excellence are key challenges. (AeIGT:, 2003 cited in Johns et al., 2005).

model (Håkansson and Snehota, 1995), and the event-based business network (Hedaa and Törnroos, 1997). The first two models study business markets focusing on the nature of buyer-supplier relationships and their embeddedness in industrial networks, acting as interconnected actors, activities, and resources. Hedaa's event networks view interactions as streams of events that ultimately determine effectiveness in networks. Events generated by extensive interactions can reveal exception-handling processes under uncertainty, and provide insights into the dynamics of network evolution (Hedaa and Törnroos, 1997; Scheer, 1998). Where strong inter-organizational relationships exist, another type of network, which is neither market nor hierarchy, emerges: network processes (Easton, 1992). These network or collaborative processes represent collaborative arrangements, and rely heavily on information-sharing, influence and trust. A better access to material and immaterial resources in innovation processes renders some firms more powerful than others. The 'knowledge accessing' dynamic supply chain capability is an additional factor enabling a better competitive performance (see p. 14). This stimulates companies to pursue network dominance (Håkansson and Snehota, 1995).

The relative smaller size and consequently lower influence of the network participants create a situation where a company cannot dominate, but rather has to adapt to the network (Ford and Håkansson, 2002). Configuration of process interactions or links among multiple, equally influential partners are negotiated rather than dictated. This in turn requires more introspection of each member's process infrastructure.

These issues clearly indicate a rising need to investigate such companies that are linked via bilateral and multilateral relationships into loosely coupled process networks, and converge into open trade exchanges and/or tighter collaborative communities (or value chains according to Tapscott et al., 2000).

Ahuja (2000), in particular, investigated the role of the interfirm network structure as a predictor of innovation output. In particular, in the technological collaboration network benefits coming from interfirm collaborative linkage can rely on resource sharing, allowing firms to combine knowledge, skills, physical and intellectual assets, and access to knowledge spill-overs. Faced with turbulent environments and global business, the firm collaborates to organize resources instead of using the market or the hierarchy (Walker et

al., 1997; Lamming, 1992; Maier, 1988; Rothwell, 1994). Technology-oriented firms might lack marketing expertise, especially if they are new dedicated technology firms (Pisano, Shan and Teece, 1988), while market-oriented companies often use external know-how as a key technology source. Co-operations can also be seen as a way to gain experiences with foreign R&D activities (Brockhoff, 1998). Thus, often companies co-operate in order to get access to the target market, to catch up or advance their technology (Senker and Sharp, 1997), or to share the high market and/or technology risks. For example, Cisco Systems, Dell, Adaptec and Ingram Micro in the High-Tech industry have dominated by evolving virtual business models through tight coupling with suppliers and customers (Tapscott et al., 2000; AMR, 06/2000).

Lambe and Spekman (1997) describe how motivations for collaboration change during the stages of a technology life-cycle. Defining “value” as the satisfaction and fulfillment of customer’s expectations and the contemporaneously generation of wealth for the organizations participating to the collaboration, the value created by a specific collaboration is dependent on the degree of maturity of that collaboration (Bititci et al., 2004).

Based on a previous framework defined for supply chain collaborations (proposed by Childerhouse et al., 2003), the authors define different stages of maturity for collaborative enterprises:

- *ad hoc collaboration*, that refers exclusively to the traditional customer-supplier relationship;
- *defined and linked collaboration*, that focuses on operational issues and limited to collaborative planning, forecasting and replenishment of materials and capacities, i.e. supply chain management;
- *integrated and extended collaboration* at a strategic level where integrated and coordinated strategies lead to strategic synergy, i.e. extended and virtual enterprises.

In addition, the most mature and integrated form of collaborative enterprise are *clusters*, which represent integrated collaborations that also include supporting

infrastructures. With regard to regional clusters, Hagedoorn and Schankenraad (1994) reported a positive association between technological partnership and firm-level innovation. Furthermore, a positive benefit of direct network linkages with external alliance networks and innovation performance is confirmed by Ahuja (2000), e.g. strategic alliance networks increase patent rates for biotechnology firms (Shan et al., 1994; Walker et al., 1997). According to George et al. (2002), firms with ties to universities produce more patents than those without.

According to Granovetter (1985), “actors do not behave or decide as atoms outside a social context”. Firms interact continually in long-lasting relationships. This interaction leads to firms adapting to each other, thus making context-specific adaptations³.

Therefore, virtual companies are temporary project-based co-operations. Byrne (1993) defines a virtual company as "a temporary network of independent companies, suppliers, customers, even competitors, linked by information technology to share skills, costs, and access to one's another markets (Weisenfeld, Reeves, Hunck-Meismwinkel, 2001).

2.1 The organization for innovation

A dynamic competitive environment requires companies to quickly react to the external change, depending on their strategic behavior toward change. Non- creative companies are usually adaptive or defensive (see Fig. 4), whilst creative ones tend to engage an innovative behavior (Vicari, 2006).

In this study, innovation entails “the introduction of new or modified products or services which are intended to be more attractive to consumers, or of new processes which lower costs or improve quality and so allow increased sales”, according to the definition

³ Granovetter (1985) discusses the concept of “embeddedness”, saying “that economic action and outcomes, like all social action and outcomes, are affected by actors’ dyadic (pairwise) relations and by the structure of the overall network of relations”.

given by Sutton (2008), that also underlines the organizational changes that “improve a firm’s ability to deliver quickly and reliably”.

Firms, even large multinational corporations, can no longer expect to be totally dependent on their in-house research and technology resources in order to maintain innovative performance. Kay (1993) considers partnered innovation as one of three distinctive capabilities required for competitive advantage, together with a consistent organizational architecture and a strong brand reputation.

Figure 4: Competitive environment and typology of organization

		Type of organizations	
		Non creative	Creative
Competitive environment	Dynamic	Flexibility, adaptability	Creativity, experimentation, innovation
	Static	Passive attitude, imitation, scarce innovation	Data gathering, detailed analysis, market research, future anticipation

Source: Vicari, 2006, adapted from Daft and Weick (1984, p. 289)

Actually the fifth innovation generation model of Rothwell (1994), already envisaged the importance of developing external relationship to create value, to be combined with the internal firm’s capabilities (see Table 2 for models evolution and details).

Time-based competition forces companies to introduce new products in shorter time to market and, possibly, at a lower cost. Organizing the new product development process according to the concurrent (or simultaneous) engineering approach strengthens the cross-

functional information sharing, and improve the internal collaboration in order to reduce the time and the risk of re-engineering order requests along the process.

This internal collaboration is the basis of an effective external communication and integration of external technologies or market inputs. The fifth stage, indeed, is characterized by an early collaboration strategy with suppliers, leading-edge customer and horizontal potential partners. In addition, thanks to the improvements of the ICT solutions, companies have the technical opportunity to effectively share data and create effective electronic linkages within their strategic network (Rothwell, 1994).

Table 2. The Innovation generations model

First generation (1950s - Mid-1960s)	Innovation process is a linear progression from scientific discovery, through technological development in firms, to the marketplace Technology push approach: "more R&D in" results in "more successful new products out" Little attention to the transformation process itself (Carter and Williams, 1957) or to the role of the marketplace in the process (Cook and Morrison, 1961)
Second generation (Mid, 1960s - Early-1970s)	Strong market orientation, "market-pull" (or the "need-pull") approach Link between strategy, marketing and R&D One of the primary dangers: neglect long-term R&D programs; become locked in to a regime of technological incrementalism (Hayes and Abernathy, 1980)
Third generation (Early, 1970s - Mid-1980s)	"Coupling" approach: market needs and technology opportunities A complex net of communication paths, both intra-organizational and extra-organizational, linking together the various in-house functions and linking the firm to the broader scientific and technological community and to the marketplace. Attention to cross-business and cross project synergies. Link between strategy, marketing and R&D.
Fourth generation (Early, 1980s—Early, 1990s)	Time-based strategies (Dumaine, 1989) and global strategy (Hood and Vahlne, 1988) Strategic alliances between companies (Contractor and Lorange, 1988; Dodgson, 1993; Hagedoorn, 1990) Intensive external networking activity (Docter and Stokman, 1987; Rothwell, 1991) Integration and parallel development (functional overlap with intensive information exchange) and early supplier involvement Cross disciplinary teams and cross-firms teams

Fifth generation (Late, 1990s-today)	<p>Explicit time-based strategy (faster, more efficient product development)</p> <p>Greater overall organizational and systems integration and external networking (SIN)</p> <p>Parallel and integrated (cross-functional) development process (concurrent engineering or simultaneous engineering)</p> <p>Emergence of true supplier/manufacturer partnerships and early supplier involvement (Lamming, 1992; Maier, 1988; Rothwell, 1989)</p> <p>Involvement of leading-edge users in design and development activities</p> <p>Strategies for horizontal technological collaboration</p> <p>Access to external know-how (buying or licensing-in existing technology)</p> <p>Good internal and external communication (effective data sharing systems and effective external electronic linkages)</p>
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Source: Adapted from Rothwell, 1994

However, the number of direct real partnerships (direct ties in the network) a company can build and maintain is limited. Therefore, partnership (as a specific type of relationships) cannot be expected to be built with a large number of customers or suppliers, and a careful planning and decision-making is necessary in order to focus the available resources on building the right relationships. In addition, components supply chains and technology supply chains differ in several aspects, as technology (and new product) supply chains are characterized by a more instable demand, highly episodic, with low volumes transacted in a early product design phase (with the unsuccessful risks and costs associated), typically requiring items with technical specifications not highly pre-specified or well-established. Collaboration in these cases strategically aims to build competences regarding the needed technology and organizational skills (see also Table 3).

The risks associated to the collaboration in new product (or service) development have been identified many forms, such as the additional financial and time costs incurred in managing the collaboration (Farr and Fischer, 1992), the loss of direct control by an organization over the product development process (Ohmae, 1989), the danger that its partners gain access to the knowledge and skills that the firm uses in other business areas (Hamel et al., 1989), and the risk of leaking company information (Littler et al., 1995). Furthermore, the relationship between two or more partners can also lead to frustration if the other party becomes less committed (Parker H., 2000). This is why, creating trust

between partners has been cited as essential for establishing collaborative relationships (Ragatz et al., 1997; Ring and Van de Ven, 1994). Ragatz et al. (1997) showed that trust is developed more through performance to expectations over time in active business relationships, rather than through formal trust development techniques. Anderson and Narus (1990) have found a strong positive correlation between the level of communication between firms and the success of their collaboration.

Table 3. Component supply chain vs Technology supply chain

Dimension of difference	Component supply chain	Technology Supply Chain
Regularity of activity	Regular and continuous flow of material	Highly episodic, occasional transfers
Transfer volume	Non-trivial volumes of common parts in batches	Single product technology
Product life cycle phase impacted	Primarily volume manufacturing, but also manufacturing ramp-up phases	Early product design phase
Product life cycle phase impacted	Typically highly pre-specified component technical specifications	Typically not highly pre-specified or well-established technical specifications
Technology risk	Generally low adaptation / integration requirements since the component, and the product system it goes into, are pre-specified	Ranges from low to very high characterization, refinement and integration activity before the transferred technology works effectively in the new product system
Key management objectives (or performance measures)	Primarily tactical, operational performance measures (e.g. component cost, delivery, quality, inventory cost)	Tactical: transfer project and development project performance measures (e.g. time, budget, technical performance of the technology in the new product system) Strategic: competence-building regarding the technology and organizational skills.

Source: Adapted from Ettlie and Reza, 1992; Deck and Strom, 2002; Melnyk and Swink, 2002

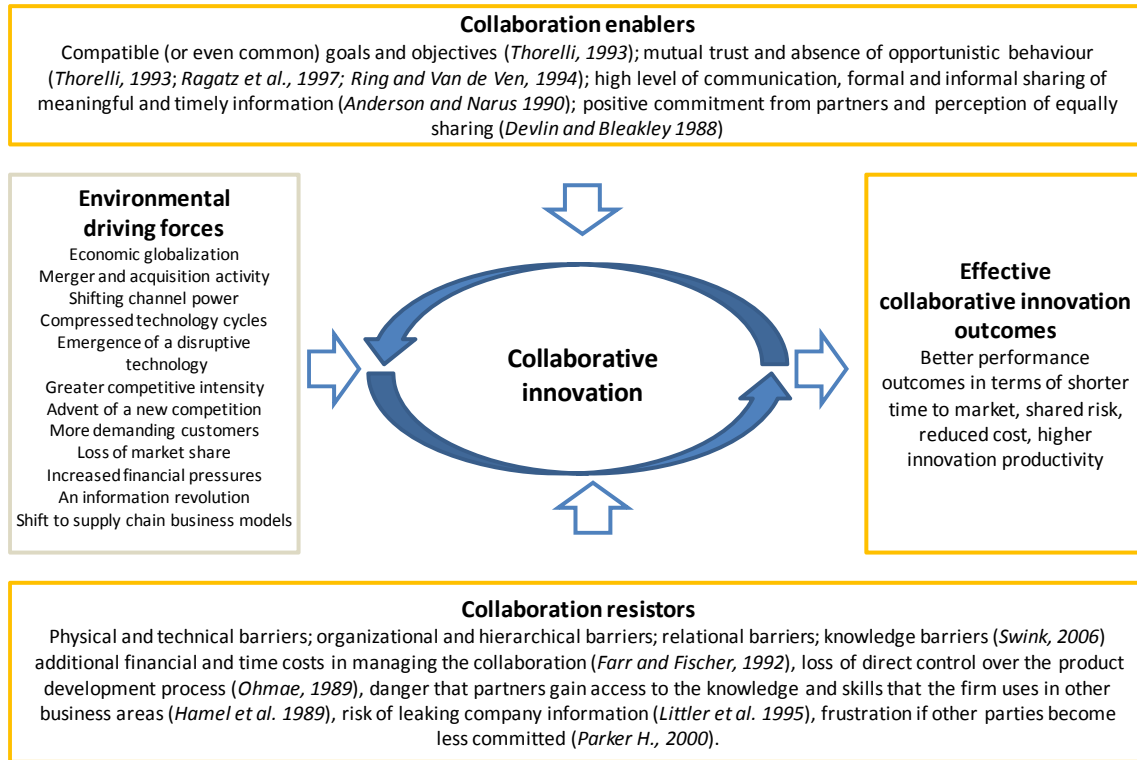
They define communication as the formal as well as the informal sharing of meaningful and timely information between firms. Lastly, a positive commitment from both partners and a perception of equally sharing benefits is important to the collaborative alliance (Devlin and Bleakley, 1988).

In the face of the cost of partnerships, Burt first (1992) and Ahuja later (2000) found that building networks with large numbers of indirect ties may be an effective way for actors to enjoy the benefits of the network size without paying the costs of network maintenance associated with direct ties.

According to Ford (1997), networking is characterized by long lasting relationships between the actors or organizations in the value system. In fact, networks create conditions for bi-lateral monopoly with high risks for both/all sides of the mutual agreements. The partnership atmosphere must include both flexibility and incentives for improvements. Prerequisites for this common platform of operations and activities in business networks are, according to Thorelli (1993):

- Mutual “trust” and absence of opportunistic behavior within the network;
- Supplementary resources or capabilities improving competitive advantage;
- Compatible (or even common) goals and objectives; and
- “Free” flows and access to information.

Figure 5. Collaborative innovation: drivers, enablers and resistors



Hence, examining the content and relative contribution of direct and indirect ties becomes relevant from the perspective of designing effective and efficient networks.

3.2 Forms of collaboration

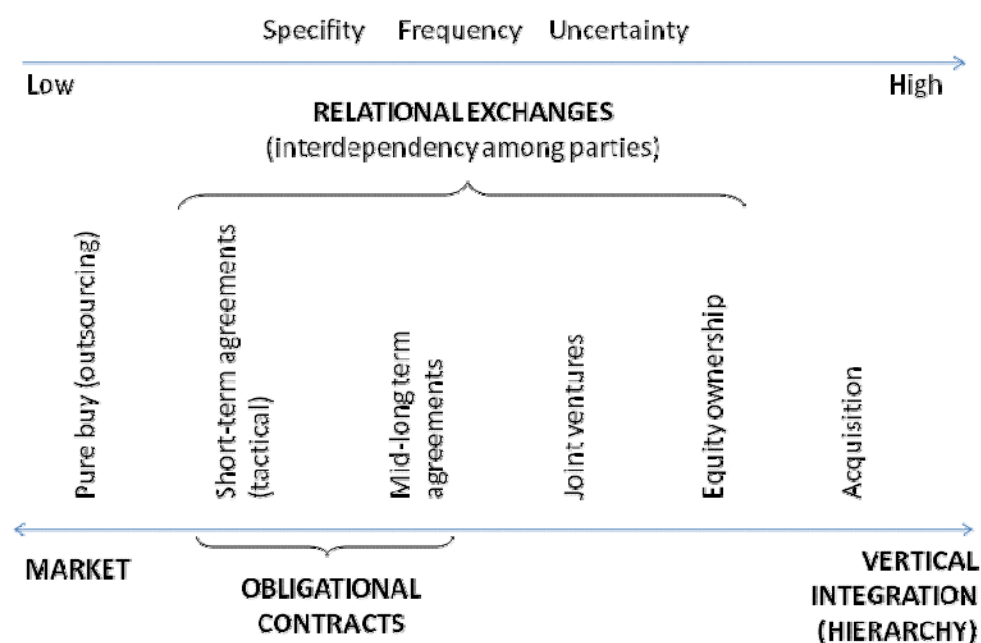
Collaboration can be analyzed in different perspective compared to the contractual form of the collaboration (integrated or not-integrated), the subjects involved and the scope of the collaboration (vertical, horizontal or lateral collaboration) or the objects transacted (components, technology, knowledge). Particularly, with reference to innovation processes, firms can collaborate at each stage of the R&D process/value chain (ideation, project development, and commercialization) enhancing their capability to scout new ideas, market

opportunities, technologies, new technology introductions, complementary assets or exploiting new distribution channels.

Contractual forms of collaboration

There are several mode of acquiring technology from external sourcing. Williamson (1975) mapped a continuum of relational exchanges (here contractual collaboration forms) between market (pure buy of existing technology or licensing-in) and vertical integration (or hierarchy) obtained through the acquisition of the external firm that owns the source of knowledge, technology or specific asset.

Figure 6. Form of collaborations according to transaction costs theory



Source. Adapted from Williamson, 1975

From the contractual perspective, according to transaction cost theory, external acquisition of technology, asset, knowledge, capability, in short competitive advantage, can be obtained through the following organizational modes, from the most integrated form to

the least one: acquisition, equity ownership (i.e. joint venture), mid-long term agreements (non-equity alliances), short-term agreement and outsourcing.

Acquisition allows one partner (A) to incorporate competencies and assets of another firm (B), becoming the full owner of the tangible and intangible resources acquired.

The acquired company can maintain its managerial autonomy (becoming a separated business unit of the acquiring company, in the *managerially autonomous acquisition*) or can be integrated in the activities / functions of the acquiring company (*managerially integrated acquisition*)

In a joint venture (Doz and Hamel, 1998) two (or more) partners allocates resources (financial, technological, know-how, assets) for the creation of a third company with equity involvement. The property of resources used for the collaboration and the final results belongs to the new corporation created. Other forms of joint venture can be mergers (two partners allocate their whole company to create a new company), minority equity, or equity consortia. From the managerial point of view they can be classified as:

- *Collectively managed joint venture*, i.e. Philips and Du Pont to develop a new process for mastering CDs, creating a joint management team for the collaboration or the European consortia with equity involvement (Eurochrysalide) to develop a totally innovative system for growing silk-worms “in vitro”; or
- *Single side managed joint venture*, usually in biotechnology industry, when a big pharmaceutical company acquire a minority equity in biotech companies, in order to access their competencies without interfere with their managerial activities

Through inter-organizational alliances (Dickson and Weaver, 1997), strategic alliances (Vyas et al., 1995), or consortia (Aldrich and Sasaki, 1995), two or more partners allocate their (physical and technological know-how) resources and each partner keeps the property of its own resources used for the collaboration activities. The resources, knowledge and capabilities are shared with the objective of enhancing the competitive

position of each partner (Spekman and Sawhney, 1990). Each partner indeed has the property and the rights of exploiting the results obtained from the collaboration.

Other forms of alliances can be non equity consortia, partnership agreements, and joint R&D projects. They can be classified in:

- *Collectively managed alliances*, where partners collectively manage the collaborations activities. For example ST Microelectronics and Hewlett-Packard create a joint team to develop components for peripherals and PCs; and
- *Individually managed alliances*, where each partner autonomously manages a definite set of activities and fulfils specific tasks (usually used within EU programs with non equity R&D consortia).

Lastly, a company (A) can acquire the results of the R&D activities done by another agent (B) through outsourcing. The resources used for the R&D activities are owned by the outsourced company. The acquiring company becomes owner of the results and has the right of their exploitation. Other forms of outsourcing are the licensing in (acquisition of external licenses) and the research contracts or research funding.

Outsourcing can be autonomous or negotiated. In the autonomous outsourcing, a company funds a research to another external subject (university, research centre, institutions, company) in order to obtain the final results, without influencing the research activities and processes. In a negotiated outsourcing activities done by the outsourcer are jointly defined with the customer, due to the high degree of codification of the research activity. It is the typical case of CRO, Contract Research Organizations in the pharmaceutical industry.

Horizontal, vertical and lateral collaboration

Networks usually are defined as the set of inter-organizational linkages a company has horizontally, vertically or laterally. Horizontal inter-firm linkages are relationships between rival firms operating at the same stage of the value chain, in general competitors or potential competitors that develop substitute products for the same market. Forging stronger ties and learning teams with other companies operating at the same level of the

supply chain helps each firm to benefit from positive network spillovers, such as the diffusion of valuable knowledge and practice. A practical example is provided by Toyota's network of suppliers, which has been studied by several researchers (Dyer and Nobeoka, 2000; Nishiguchi and Beaudet, 1998; Sako, 2004). Since Toyota ultimately benefits from the faster knowledge sharing and capabilities improvement in its supplier base, it stimulates intense collaboration among its suppliers (horizontal inter-organizational linkages). This allow suppliers to be on the cutting edge in terms of production efficiency and innovation practice (improvements in processes and product configurations), which is in the best interest of Toyota itself.

The idea that firms in the same industry can create competitive advantage through mutual collaboration has been extensively discussed by the literature on regional clusters and industrial districts, which has explained the emergence of such patterns of collaboration as a way to economize on the provision of collective resources such as skilled labor, service providers, capital, infrastructure and other factors of production (e.g. Marshall, 1920; Piore and Sabel, 1984; Schmitz and Nadvi, 1999; Wong-Gonzalez, 1992, cited in Lazzarini et al., 2008).

Nevertheless, horizontal collaborations may occur in different locations creating broad and representative alliances, committees or learning groups to exchange best practices, to synergistic solve specific problems, support joint market products, develop new distribution channels, and share resources (such as contacts and infrastructure) to reach new markets (Lazzarini et al., 2008).

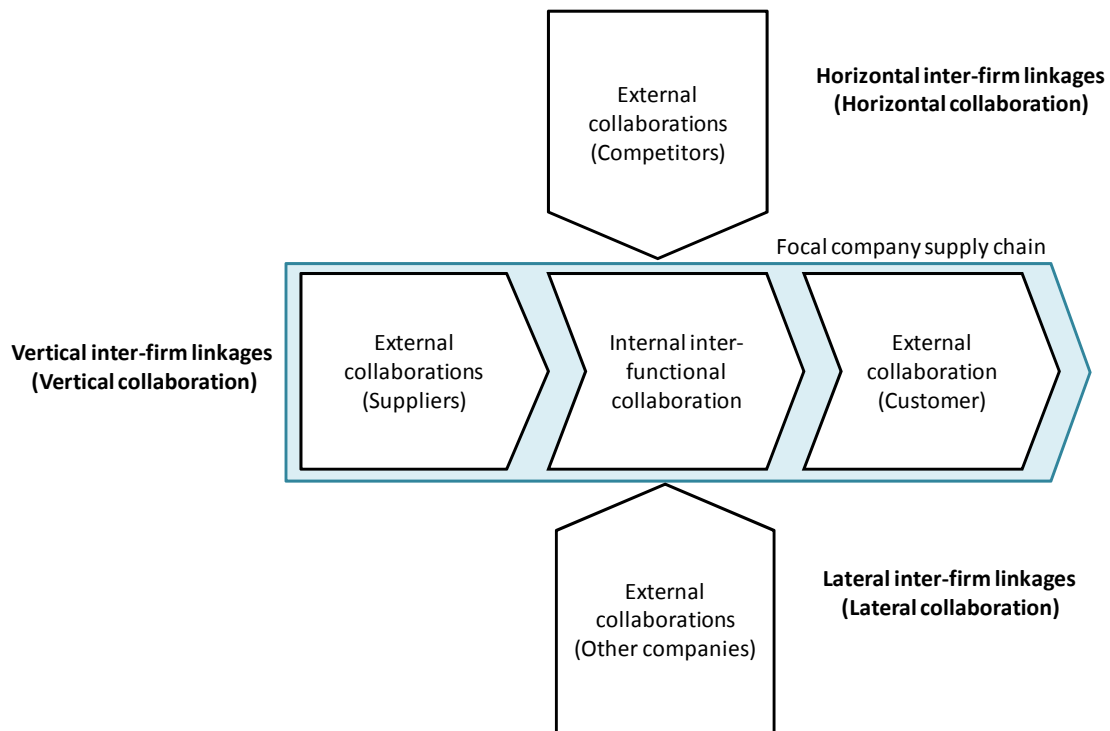
Vertical inter-firm linkages are relationships between complementary firms that operate at different stages of the value chain. The most common relationships are between buyer and supplier, co-creation processes with the customer (user driven innovation), or linkages between firms with complementary asset to successfully introduce innovation into the market, such as distribution, marketing, or after-sales support (for instance, between producer and distributors).

Intense vertical collaborations typically require intense amount of joint effort in the activities in which partners are involved. Such intense vertical alliances have been found to positively influence the performance of buyers and suppliers, in terms of both production

efficiencies and innovation (Corsten and Felde, 2005; Clark, 1989; Cusumano and Takeishi, 1991; Kotabe et al., 2003; Srinivasan and Brush, 2006).

The benefits and sharing capabilities of both vertical and horizontal integration are combined in lateral collaboration. Integrated logistics and inter-modal transport are examples of an application of lateral integration in supply chain that aims at synchronizing carriers and shippers of multi-firms in a seamless effective freight transport network (Simatupang and Sridharan, 2002).

Figure 7: Scope of the collaboration: horizontal, vertical and lateral inter-firm linkages



Source: Adapted from Barratt, 2004

3.3 Collaborative innovation along the supply chain

Product innovation and supply chain process innovation efforts have traditionally been managed as separate activities (Swink, 2006). Software-based collaboration solutions are widely available today but the problem is not the technical feasibility to share ideas or information, but the organizational attitude and culture to collaborate inter-functionally, inter-divisionally or with external players.

Internal cross-functional collaboration, as recommended in concurrent or parallel engineering approach, increases the quality of the final output, integrating since the beginning the different competencies required in a new product development project, reducing the time to market and the final cost of the new product due to the lower number of modifications required along the project. Early involving the downstream functions (operations, logistics, supply chain, procurement) the firm can anticipate potential conflicts that will entail necessary changes of the project.

Extending this approach to external player, as for suppliers or lead customer for example, the company may add important knowledge to its innovation process. Today concepts as “Co-makership”, “Early Supplier Involvement”, and “Concurrent Engineering” are popular. The strong collaboration with the supplier base partially explains the success of the Japanese automotive industry, 1980’s and some remarkable performances in other industries, such as 30-50% reduction in time-to-market at Kodak, Motorola and Bosch or 50% reduction development costs at Xerox (Wynstra et al., 2001).

However, beside these potentially notable results, previous researches highlighted that involving external suppliers did not automatically improves the innovation process performances. In particular, citing two previous studies (respectively Hartley, 1994 and Birou, 1994) 79 firms in the electromechanical industry did not obtain any reduction of product cost, neither a better product, or shorter time-to-market. Similarly, 83 projects in the automotive, electronics and medical industry registered even a higher product and development cost, sometimes a worse product quality and, often, a longer time-to-market.

The problems are generally related to the limited experience of both parties to the new project, the absence of clear agreements, the selection criteria of supplier based on

price rather than innovativeness, and collaboration practices kept up with too many and/or insignificant suppliers. In addition, often the manufacturer (buyer) often demonstrated an internal insufficient collaboration combined with the perception that the supplier involvement was a threat instead of an opportunity (“not invented here” syndrome). In short, the problem is frequently not technical but organizational. More recent studies confirm that collaborative development efforts still face several barriers, such as (Swink, 2006):

- *physical and technical barriers*, impeding real time and rich communication among new product development project team members. Co-location, communication technologies and concurrent engineering approach may help to overcome them;
- *organizational and hierarchical barriers*, especially reinforced by a bureaucratic mindset, that impede the information sharing along the process. These barriers are even more counterproductive when the collaboration involves players beyond the firm’s boundaries. Cross functional or joint development team structures with access to the relevant project information may be the organizational answer to this barrier. Obviously the “hard” solution (the organizational structure) has to be combined with the “soft” skills of people that demonstrate the willingness to collaborate and the necessary level of trust to share confidential project information;
- *relational barriers*, caused generally by a perceived threat to autonomy or a perceived loss of power or status. A major challenge for some organizations is to find personnel who have the personal and technical skills to collaborate outside their normal work settings and is able to constructively communicate with people that have a different scientific or technical background. Explicit common

goals, aligned values and incentives and training programs in various social and cultural environments help people to get over these barriers⁴;

- *knowledge barriers*, often related to the inability to explain how processes or technologies work, especially for the tacit form of knowledge that is difficult to be codified.

The process of collaborative innovation starts with recognizing fundamental relationships between the activities each functional area performs. To maximize the effectiveness of collaboration, this initial awareness has to evolve into a holistic vision that captures all the interactions and interdependencies among development activities. The resources and levels of commitment required to realize this vision may seem overwhelming and difficult to justify, and remain an open question in the collaborative and open innovation studies (see also chapter 3.4).

Nevertheless, collaborative benefits are likely to far prevail over the profits associated with any single product developed because they relate to a path of successive collaborative efforts build as time goes by. In addition, collaborative experiences encourage continuous organizational learning processes that improve personnel capabilities and create technical experts and managers who are more aware of the needs of other functional areas (or business units) and of the company's goals.

⁴ Relational barriers may also be created by cultural differences among potential collaborators. As product innovation becomes more and more a global enterprise, product-process development team members need to become more sensitized and knowledgeable regarding social and cultural norms of communication in different parts of the world (Swink, 2006).

3.4 The open innovation revolution

Innovation performance is critical to firms' success and survival (Gassmann, 2006). Chesbrough (2003) argues that the innovating company should actively access and integrate external knowledge with its own innovation process to create value for customers (Chiang and Hung, 2010).

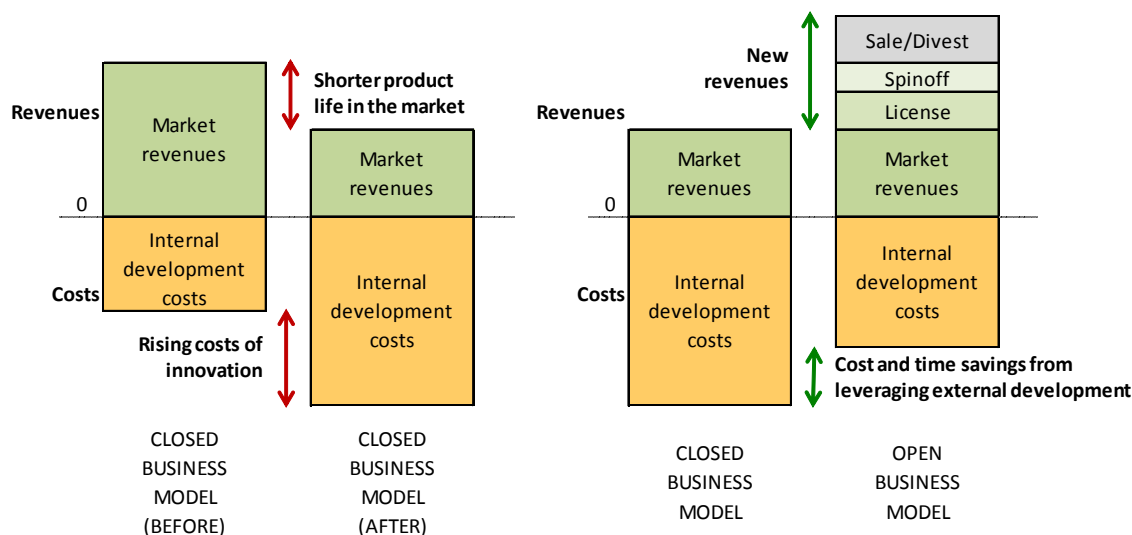
Once the notion of inter-organizational innovation collaboration has entered an industry, anyone who does not participate will cope with serious competitive disadvantages. Even worse, Koschatzky (2001) found that 'firms which do not cooperate and which do not exchange knowledge reduce their knowledge base on a long-term basis and lose the ability to enter into exchange relations with other firms and organizations'. Innovation networks are particularly important in those industries where technology changes rapidly and product life cycles are short (Dittrich and Duysters, 2007).

In contrast to Closed Innovation approach, that is characterized by a protected, internal development kept secret and not shared with external players, Open innovation has been defined as “. . . *the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively*” (Chesbrough et al., 2006).

The value of this approach is widely recognized (Chesbrough, 2003; Chesbrough and Crowther, 2006), especially in the rapidly changing technological domain (Asakawa, K., Nakamura, H. & Sawada, N., 2010).

As previously mentioned, the rising development cost in many industries associated with the shortening life cycle of new products and services, makes the traditional “closed approach” to innovation difficult to sustain, because the value created is temporary and reduced compared to past.

Figure 8. Closed and open innovation business models



Source: Chesbrough, H.W., 2007

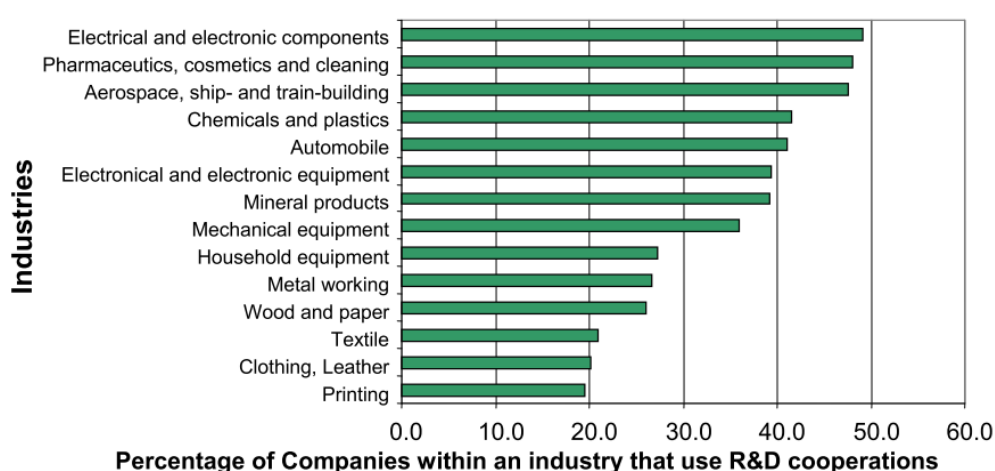
“Open innovation” business model faces both sides of these trends (Chesbrough, 2007). On one hand it reduces the investment in innovation by leveraging external research and development resources to save time and money in the innovation process: indeed, the development costs of innovation are reduced by the greater use of external technology in a firm’s own R&D process. On the other hand it increases the possibility to obtain market revenues through new sources of new technology or product (and service) introduction, such as licensing out, spin offs, spill-overs and divesting businesses that are no more consistent with the company’s strategy.

Open innovation mainly started in the high-tech sector, but there is a new trend for the low-tech companies to exploit the potentials of opening up their innovation process (Gassmann, Enkel, Chesbrough, 2010).

The open innovation business model is today applied in different sectors, such as machinery, turbines, medical tools, fast moving consumer goods, food, architecture and logistics (see Fig. 9). User-driven innovation has the longest tradition: some examples are the construction and elevator industries (Herstatt and von Hippel, 1992; Boutellier et al.,

2008) and the sports industry (Hienerth, 2006). Besides users' systematic involvement in the early phase of innovation, these industries have started to open up in all other directions as well. Not only has supplier integration's potential been discovered but also the more systematic use of universities and knowledge brokers, integrating in a single "practice" what was before generally defined collaboration.

Figure 9. Impact of cooperation in innovation in different industries



Source: Enkel and Gassmann, 2007

Today's business reality is not based on pure open innovation but on companies that invest simultaneously in closed as well as open innovation activities (Ellen Enkel, Oliver Gassmann and Henry Chesbrough, 2009). Internal experts should also naturally and routinely develop their network and seek external potential solution providers.

Mortara et al. (2009) studied the interpretation of the Open Innovation models in different industries, particularly in electronics and telecoms, energy/oil, aerospace and defense, fast moving consumer goods and software and media. Except for aerospace and defense that are characterized by longer technology life cycle (but as well complex technologies and rising R&D and innovation costs), the industries analyzed in the study seek for external sources or collaboration as an opportunity to innovate and increase competitive advantage, gaining access to new technologies, in order to reduce development costs and time or define new standards for the market (see also Table 4).

Table 4. Trends in OI interpretation across different sectors

	Industry characteristics	What form does OI take?
Electronics and telecoms	Strong need to adapt to growing demand from consumers and keep up to date with the rapid pace of technology development. Importance of collaboration to create industry standards. Reducing costs is a priority.	OI is being used as a means of gaining access to new technologies in order to anticipate competition, keep up with fast moving markets and reduce costs. Standards and regulations are both an opportunity to work openly and a “constraint” on innovation.
Energy/oil	Business is changing because of sustainability issues (declining oil supplies, global warming).	OI is an opportunity to identify new technologies to improve oil supply and to help the industry evolve and increase its sustainability.
Aerospace and defense	Traditional engineering businesses. Long technology lifespan and long lead times for their adoption. Strong confidentiality issues especially for defense. Strong influence of policy makers and government on innovation strategies.	OI is a new concept, especially for defense companies who are wary of information leaks. However, OI approaches are being adopted in response to increasingly complex technologies and rising R&D and innovation costs.
FMCG	Need to reduce time to market and to find new ideas to generate new products. Strong marketing influences innovation strategy.	OI is an opportunity to innovate and increase competitive advantage. Most FMCG companies are currently developing their OI strategies (more formalized OI).
Software and media	Software companies have almost always been open due to the nature of their technology.	Open source software, and Internet 2.0 have revolutionized the innovation processes so that users (customers) can themselves contribute to innovation.

Source: Mortara et al., 2009.

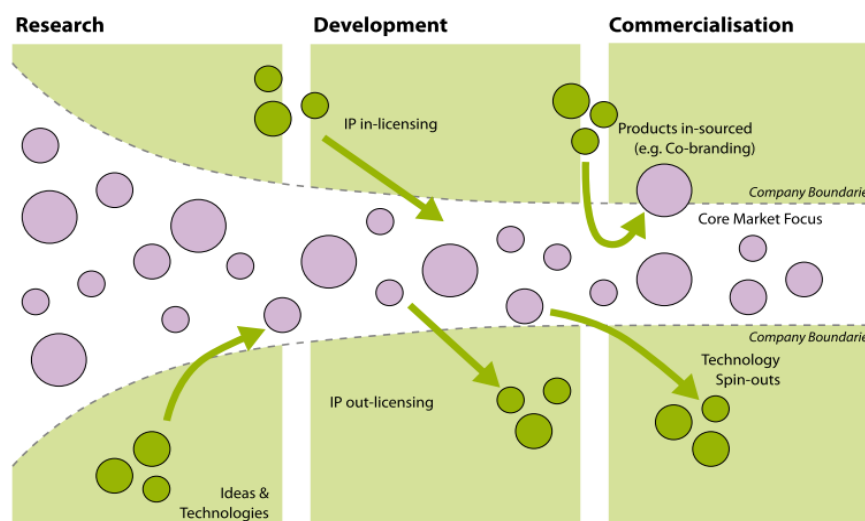
Depending on how external sources are leveraged, open innovation can be described through three different perspectives:

- the *outside-in process*, enriching the company’s own knowledge base through the integration of suppliers, customers, and external knowledge sourcing. Within this process, we can see an increasing awareness of the importance of innovation networks (Dittrich and Duysters, 2007; Chesbrough and Prencipe, 2008; Enkel,

2010), new forms of customer integration, such as crowd sourcing (Howe, 2008), mass customization, and customer community integration (Piller and Fredberg, 2009), as well as the use of innovation intermediaries, such as Innocentive, NineSigma, or yet2.com (Lakhani, 2008; Piller, 2009).

- the *inside-out process*, that refers to earning profits by bringing ideas to market, selling IP and patents, and transferring technology to the outside environment, as an additional source of income from the innovation (Gassmann and Enkel, 2004; Lichtenthaler and Ernst, 2007). Within this process, companies increase the number of their corporate venturing activities (Vanhaverbeke et al., 2008), new ventures and spin-offs (Chesbrough, 2007), and the commercialization of technologies in new markets called cross-industry innovation (Enkel and Gassmann, 2010).
- the *coupled process*, that refers to the co-creation with (mainly) complementary partners through alliances, cooperation, and joint ventures. Firms that establish the coupled process approach combine the outside-in process (to gain external knowledge) with the inside-out process (to bring ideas and technologies to market) and, in doing so, jointly develop and commercialize innovation. Co-creation is widely studied in the open innovation management literature. Derived from open source project development (Von Hippel and von Krogh, 2006), open innovation strongly focuses on peer production through communities (Lakhani et al., 2008;), consumers (Hienerth, 2006; Lettl et al., 2006), lead users (Franke et al., 2006), universities or research organizations (Perkmann and Walsh, 2007), and partners from other industries (Enkel, Gassmann, Chesbrough, 2009).

Figure 10. The open innovation process

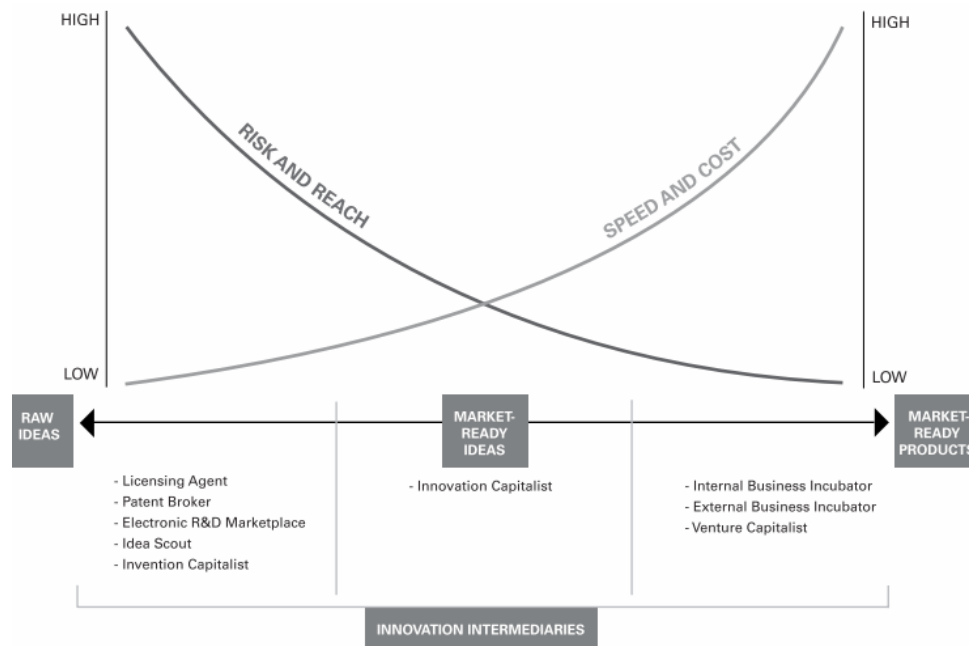


Source: Mortara et al., 2009.

From the external sources perspective there are several different opportunities ranging from simple raw and undeveloped ideas, patents, technologies or market-ready solutions. Some authors (Nambisan and Sawhney M., 2007) defined this multitude of external marketplace for innovation the “innovation bazaar” to highlight the variety of approaches that a company can pursue and the difficulty to find the right one, which is consistent with its internal capabilities.

Innovation intermediaries (also known as “innomediares”, Sawhney and Prandelli, 2000) arise as new players that help companies to identify the right “counterpart” or “partner” without revealing in advance confidential information, thus acting like clearing houses. The different alternatives of external sourcing are described according to four dimensions: the reach that companies have in developing the external sources of innovation, the risk associated to transform the external source into a successful marketable product (very high for raw ideas to very low for ready-to-market products), the cost of acquisition and development of the external ideas, technologies or products and the speed to convert them into a product to be launched on the market (on the opposite, usually low for raw ideas and high for ready-to-market products).

Figure 11. The external sourcing continuum for innovation



Source: Nambisan and Sawhney M., 2007

Companies then may shop for different sources to fit their different business strategies. Medium sized companies with a large range of products, a high propensity to risk and capability to develop and commercialize products may search for new external raw ideas, especially if the pace of innovation of the industry in which they compete is low. In this case, indeed, they can spend time to study and internally develop external ideas that are easy to acquire at a low cost. On the opposite side, large companies competing in an extremely dynamic context, adverse to risk, with an established capability of commercialization (but weaker capability of internal development due to the required time to market) might prefer a strategy of external searching (and acquisition) of market ready products. The acquisition sometimes may include the whole company that produces the market-ready solution. Finally, market-ready ideas search is consistent with companies that have the possibility (adequate time and complementary internal competencies) to develop and commercialize ideas that have a clear target market appropriate for their existent product and brand portfolio.

Table 5. Innovation sourcing strategies

		Search for Raw Ideas	Search for Market-Ready Ideas	Search for Market-Ready Products
Industry / Market factors	Pace of technological and market change	Low	Medium	High
	Intellectual property context	Well-defined IP rights	Roughly defined IP rights	Poorly defined IP rights
	Market potential for typical innovation	<\$100M revenues	\$100M-\$500M revenues	>\$500M revenues
	Cost of evaluating typical innovation	Low (ideas can be tested in isolation)	Medium (detailed market/technology assessment required)	High (expensive infrastructure required)
	Information required to develop typical innovation	Specific knowledge about innovation	Integrated knowledge from different business functional areas	Complex and integrated knowledge from different technologies and markets
Company factors	Purpose of innovation	Enhancement of existing products	New products and brand extensions	New markets and redefined product portfolios
	Innovation capabilities	Strong development and commercialization	Moderate development and strong commercialization	Weak development and strong commercialization
	Product portfolio	Large number of diverse products	Products in a few key markets	Products in a few key technology domains
	Company size	Medium	Medium to large	Large
	Risk appetite	High	Medium	Low
	Innovation portfolio	Weak, needs externally sourced ideas	Complementary to external sourced ideas	Weak, needs externally sourced products

Source: Nambisan and Sawhney M., 2007

Table 5 summarizes the three strategies, explicating the industry/market factors and the company factors in which they are suitable.

These sourcing strategies may be (or not) supported by an external innovation intermediary, whose role differs depending on the objective of the transaction. For example

raw ideas sourcing implies an external broker that seeks out and filters ideas on behalf of its client company, connecting it with external suppliers, independent inventors, or patents owners. Then companies review them for their commercial potential. This is the case of invention capitalists⁵ or electronic ideas and technology marketplaces (such as Innocentive, Yet2.com, YourEncore, IdeaConnection, Big Idea Group, Chaordix, Innovaro, just to mention a few⁶).

Ready to market products can be scouted directly by companies through internal business incubators, or searched with the help of external business incubators and venture capitalists. Its main role is to connect companies with new ventures that have market ready products thanks to their market and financial expertise.

Lastly, Innovation Capitalists create market-ready concepts by building on and transforming raw ideas that are sold to customer companies in order to be industrialized and commercialized. To create an effective relationship, client companies should provide Innovation Capitalists with direction and guidance about their product gaps, innovation priorities, and business goals by sharing information based on a trusted and long-term relationship. In fact, knowing the client's goals enables the innovation capitalist to match them with promising ideas and concepts from its inventor networks and to evaluate those ideas that better fit the client's market size, profit margins, and commercialization infrastructure.

⁵ A term used by Microsoft's former chief technology officer Nathan Myhrvold (as cited in Nambisan and Sawhney M., 2007)

⁶ For additional information see the official websites: Innocentive (www.innocentive.com), Yet2.com (www.yet2.com), YourEncore (www.yourencore.com), NineSigma (www.ninesigma.com), IdeaConnection (www.ideaconnection.com), Big Idea Group (www.bigideagroup.net), Chaordix (www.chaordix.com), Innovaro (www.innovaro.com), last accessed December 2010.

3.5 Building collaborative innovation capabilities

As for the supply chain dynamic capabilities model (see chapter 2.3, p. 14) sustainable competitive advantage can be obtained only through continuous temporary competitive advantages, as the context considered is dynamic and not static.

Considering innovation processes companies can build temporary sustainable competitive advantages by better using existing resources and capabilities and creating new ones. The preconditions for such dynamism resides in an open innovation orientation, meaning that companies are able to continuously identify their core competencies, their competence gaps and possess an open attitude to scout outside a specific function or laboratory other complementary competencies, resources, technologies, ideas or, in general, external source of innovation (included market-ready products as described in chapter 3.4, p. 50). These sources can be retrieved internally (as for multinational companies searching in other business units) or through the involvement of external suppliers or partners.

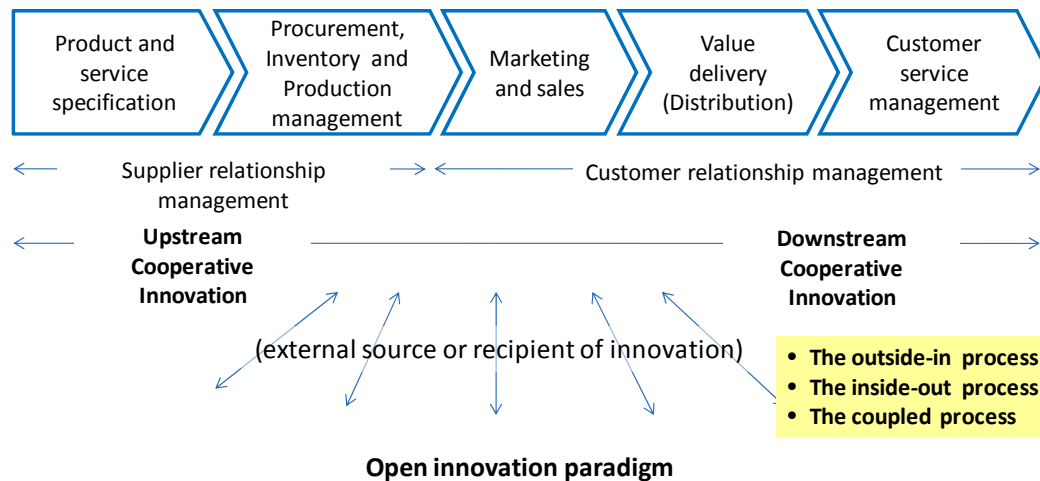
A learning orientation is necessary to enable a company to develop its dynamic capabilities, as described in chapter 2.3, see also Fig. 1, page 14). Helfat et al. (2007) define a dynamic capability as “the capacity of an organization to purposefully create, extend, or modify its resource base”. Consistently with this definition, firms need to dynamically develop their knowledge capacities to profit from collaborative and open innovation (Chesbrough, 2006; Teece, 2007). External sources of innovation are not restricted to upstream and downstream collaborative innovation, but may involve a higher number and typology of external players.

Dynamic innovation capabilities in a collaborative innovation context can be identified into three different categories:

- *knowledge accessing capabilities*, that directly improve the efficient use of static capabilities due to the capability to find out the best resource, technology, or competence to combine with the company’s innovation process;

- *co-evolving capabilities* that reshape the portfolio of firm's capabilities thanks to the recombination with external sources of innovation. Multiple authors have underlined the critical role of combining internal and external knowledge in innovation processes (Andersen and Drejer, 2008; Hargadon and Sutton, 1997; von Hippel, 1988);
- and, especially in innovation networks, *knowledge managing capability*. According to Lichtenhaler and Lichtenhaler (2009) knowledge management capacity is defined as a firm's ability to dynamically manage its knowledge base over time by reconfiguring and realigning the processes of knowledge exploration, retention, and exploitation inside and outside the organization. Firms need to continuously transform their knowledge capacities, which dynamically develop in an evolutionary path to fit changing environments (Campbell, 1960; Teece et al., 1997).

Figure 12. Collaborative innovation: from dyadic relationships to networked collaborations



According to knowledge management and dynamic capabilities research, knowledge involves know-how and information (Helfat et al., 2007; Kogut and Zander, 1992). *Know-how* refers to accumulated skills and expertise, whereas information primarily comprises facts that may be codified (Kogut and Zander, 1992; Szulanski, 1996).

While the knowledge capacities refer to processes at the knowledge level (Eisenhardt and Martin, 2000), knowledge management capacity refers to transforming the knowledge capacities, thus adopting a perspective above the capacity level. Hence, it may be regarded as a 'second-order' dynamic capability, which is directed at 'meta-processes' that make a firm's knowledge management a higher value than the sum of the distinct knowledge processes (Zahra et al., 2006; Zollo and Winter, 2002).

Concerning dynamic capabilities, knowledge management capacity may have to be reconfigured based on a firm's strategy. For this reason, firms need to balance strategy formulation with sufficient flexibility in changing environments (Burgelman and Rosenbloom, 1989; Volberda, 1996), as highlighted by ambidexterity research too (Ambos et al., 2008; Tushman and O'Reilly, 1996). Nevertheless, while the path-dependent development of the knowledge capacities enhances their technical strength, they become more resistant to reconfiguration (Zahra et al., 2006). Firms therefore need to balance the use of the knowledge capacities and knowledge management capacity based on the degree of environmental turbulence.

Lichtenhaler and Lichtenhaler (2009) propose new types of ambidexterity arising by combining internal and external knowledge processes, in contrast to prior ambidexterity research which has usually focused on exploration and exploitation inside the firm (Raisch and Birkinshaw, 2008). With reference to dynamic knowledge management capability the authors analyze the three stages associated with the innovation processes: the knowledge exploration, the knowledge retention and the knowledge exploitation from both perspectives, internal and external.

In knowledge exploration, this issue has been termed 'make-or-buy' decision (Cassiman and Veugelers, 2006). In knowledge retention, firms face the 'integrate-or-relate' issue, which refers to the possibility of incorporating knowledge into the internal knowledge base or relying on interfirm relationships, which represent the external knowledge base. Lastly, in knowledge exploitation, a firm is confronted with the 'keep-or-sell' problem (Lichtenthaler, 2007).

Table 6. Firm's critical knowledge management processes

	Exploration (make-or-buy)	Retention (integrate-or- relate)	Exploitation (keep-or-sell)
Internal (Intrafirm)	Internal knowledge exploration refers to generating new knowledge inside the firm, e.g. inventions resulting from research (Smith et al., 2005).	Internal knowledge retention is a result of the need for maintaining knowledge over time (Garud and Nayyar, 1994).	Internal knowledge exploitation describes internal innovation, i.e. knowledge application in a firm's own products (Brown and Eisenhardt, 1995).
External (Interfirm)	External knowledge exploration describes the acquisition of knowledge from external sources (Lane et al., 2006).	External knowledge retention refers to knowledge that is maintained in a firm's inter-organizational relationships, e.g. alliances (Gulati, 1999).	External knowledge exploitation refers to outward knowledge transfer, e.g. by means of technology alliances or technology licensing (Lichtenthaler, 2007).

Source: Adapted from Lichtenthaler and Lichtenthaler (2009)

The framework proposed define six knowledge capacities (Argote et al., 2003; Lane et al., 2006): inventive, absorptive, transformative, connective, innovative, and desorptive capacity (Table 7). On top of these knowledge management capabilities, *integrative knowledge management* (Cassiman and Veugelers, 2006; March, 1991) refers to the capability of a firm to successfully reconfigure and realign its knowledge management capabilities to adapt to changing environmental conditions better and sooner than its competitors (Eisenhardt and Martin, 2000).

From the internal and intra-firm perspective, *inventive capacity* refers to a firm's ability to internally explore knowledge, i.e. to generate new knowledge inside the firm. inventive capacity comprises the process stages of internally generating new knowledge and integrating it into the firm's base of existing knowledge (Nonaka, 1994; Smith et al., 2005). The generation of new knowledge is usually a reaction to a perceived need for that knowledge (Shane, 2000). As a consequence, the level of inventive capacity is strongly affected by a firm's level of prior knowledge in a particular field because it facilitates the generation and integration of new knowledge (Khilji et al., 2006). *Transformative capacity* refers to a firm's capability of internally retaining knowledge over time (Garud and Nayyar,

1994). Knowledge retention needs to be actively managed by assigning resources to who keeps the knowledge ‘alive’ (Campbell, 1960; Lane et al., 2006). The more prior knowledge a firm has in a given field, the easier it is to maintain and reactivate additional knowledge (Garud and Nayyar, 1994). These benefits from prior knowledge indicate path-dependencies in knowledge retention (McGaughey, 2002; Pandza and Holt, 2007). *Innovative capacity* is a firm’s ability to internally exploit knowledge. Innovative capacity comprises the process stages of transmuting knowledge and converting it into new products or services (Khilji et al., 2006).

Table 7. Knowledge managing dynamic capabilities

	Knowledge exploration	Knowledge retention	Knowledge exploitation
Internal (Intrafirm)	Inventive capacity	Transformative capacity	Innovative capacity
External (Interfirm)	Absorptive capacity	Connective capacity	Desorptive capacity

Source: Lichtenhaler and Lichtenhaler (2009)

Adding the external perspective, and the consequent increased potentiality of value creation through external sources, companies need to develop *absorptive*, *connective* and *desorptive capacities*.

Absorptive capacity relates to exploring, recognizing, assimilating external knowledge (not necessary its application because this refers to the exploitation process) (Cohen and Levinthal, 1990; Zahra and George, 2002; Lane et al., 2006; Lichtenhaler, 2009).

Similar to internal knowledge retention, external networks have to be maintained and managed over time (Kale and Singh, 2007). *Connective capacity* refers to a firm’s ability to retain knowledge coming from interfirm relationships and comprises elements of alliance capability (Kale and Singh, 2007) and relational capability (Lorenzoni and Lipparini, 1999). Lichtenhaler and Lichtenhaler (2009) define connective capacity as a

firm's ability to retain knowledge outside its organizational boundaries. In contrast to absorptive capacity, external knowledge retention does not assume inward knowledge transfer. Accordingly, connective capacity comprises the process stages of maintaining knowledge in inter-organizational relationships and subsequently reactivating this knowledge (Garud and Nayyar, 1994; Grant and Baden-Fuller, 2004). Finally, *desorptive capacity* describes a firm's capability of exploiting external knowledge, which complement the internal knowledge application to a firm's own products (Lichtenthaler, 2007). External knowledge exploitation refers to outward knowledge transfer, licensing out inventions and technologies, which has recently become a broader trend (Fosfuri, 2006).

4. Research objectives and methodology

4.1 Research objectives

This study aims to go beyond a general understanding of the importance of collaborative and open innovation and explore what are the actions taken by companies who implemented these approaches and how did they obtain positive results.

Due the complexity of the phenomenon considered and the dynamic context in which companies compete, the research questions of this study aim to identify

RQ1. What are the determinants of a framework for network dynamic innovation capabilities?

RQ2. What capabilities do companies have to develop in order to enable the implementation of the framework?

RQ3. What are the patterns they followed to build such capabilities?

Multi-level theory is considered appropriate for studying a complex phenomenon like innovation (Rousseau, 1985; Klein et al., 1994). Because most innovation research tends to focus on one level of analysis (Gupta et al., 2007), such an approach does not reflect the reality in which open innovation takes place at multiple levels within a firm. This study is therefore based on three levels of analysis: corporate strategy and culture (strategy), new organizational processes and capabilities(processes) and new competencies and skills needed at the individual level (people).

4.2 Research methodology

The research project started with a comprehensive literature review conducted on the collaboration concept both in Supply Chain Management and in Innovation Management discipline, given that little research has been done on the effects of collaboration in continuous innovation along the supply network and with the contribution of a more than one established partnership. The initial search focused on articles in leading Operations Management and Supply Chain Management related journals, Product Innovation journals, but was expanded to other academic journals (Strategy and Organization). Besides that, trade press articles and third party report were reviewed, using the EBSCO BSC and ABI/INFORM databases.

The original idea on the objective of the study was refined through two different focus groups. The first one, conducted in, 2009, aimed at highlight the perceived different capabilities required to innovation managers (and people involved in innovation processes such as CEOs, Business Innovation Managers, Business Development Managers, Chief Technology Officers) in order to cope with the dynamic competitive environment in which their companies operate (new processes and personal competencies level of analysis). The second one, conducted at the beginning of 2010, intended to explore and analyze in depth which are the main challenges for companies in the near mid-term and the required competencies, in order to add a strategic level of the analysis and refine the operative level previously investigated.

The focus groups studies helped to better define the research questions that are worth pursuing further through a qualitative research, based on case studies analysis.

According to Denzin and Lincoln (1998) qualitative research methods provide the ability to develop deeper understanding of phenomena considered. Specifically, case study research allows the investigation of a contemporary phenomenon within its real life context especially when the boundaries between phenomenon and context are not clearly evident (Yin, 2003). The relevant theory will be generated from the understanding gained through observing actual practices in their natural setting.

The case research method allows the questions of why, what and how, to be answered with a relatively full understanding of the nature and complexity of the complete phenomenon (Voss et al., 2002; Bebensat et al., 1987; Meredith, 1998).

A case study is a history of a past or current phenomenon, drawn from multiple sources of evidence. It can include data from direct observation and systematic interviewing as well as from public and private archives. In fact, any fact relevant to the stream of events describing the phenomenon is a potential datum in a case study, since context is important (Leonard-Barton, 1990). A case within its context is a unit of analysis in case research. Actually cases from the same companies but in a variety of different contexts are considered multiple units of analysis, typically in longitudinal studies. Research conducted within the qualitative paradigm is indeed characterized by its commitment to collecting data from the context in which social phenomena naturally occur and generate an understanding that is grounded in the perspectives of research participants (Bryman, 1988; Lofland and Lofland, 1995; Marshall and Rossman, 2010; Miles and Huberman, 1984).

Case studies can be used for different types of research purposes such as exploration, theory building, theory testing and theory extension/refinement. Apart from their exploratory value, case studies provide a platform for theory building (Eisenhardt, 1989). Overall, operations management is a very dynamic field in which new practices are continually emerging. Thus, according to Voss et al., 2002 “case research provides an excellent means of studying emergent practices”.

Theory is made up of four components: definitions of terms or variables, a domain, that is the exact setting in which the theory can be applied, a set of relationships and specific predictions (Wacker, 1998). It can be considered as a system of constructs and variables in which constructs are related to each other by propositions and the variables are related to each other by hypotheses (Baccarach, 1989), depending on the purpose of the research. Case research is considered to be particular strong with a theory building purpose, especially with few in depth case studies, advisably chosen.

Table 8. Matching research purpose with research methodology

Purpose	Research question	Research structure
Exploration Uncovered areas for research and theory	Is there something interesting enough to justify research?	In-depth case studies Unfocused, longitudinal field study
Theory building Identify/describe key variables Identify linkages between variables Identify “why” these relationships exist	What are the key variables? What are the patterns or linkages between variables? Why should these relationships exist?	Few focused case studies In-depth field studies Multi-site case studies Best-in-class case studies
Theory testing Test the theories developed in the previous stages	Are the theories we have generated able to survive the test of empirical data? Did we get the behavior that was predicted by the theory or did we observe another unanticipated behavior?	Experiment Quasi-experiment Multiple case studies Large-scale sample of population
Theory extension/refinement To better structure the theories in light of the observed results.	To what extent can the theory be generalized? Where does the theory apply?	Experiment Quasi-experiment Case studies Large scale sample of population

Source: Voss et al., 2002, adapting Hadfield and Melnyk, 1998

When case research is used for a theory testing purpose, generally it is combined with surveys in order to achieve triangulations of data sources. Lastly case-based methodology can be employed for theory extension and refinement, to examine more deeply and validate previous empirical results.

Notwithstanding researches based on case-based methodology are not as published in international journals of operations management as those that use quantitative methodologies, the potentiality of case-based research is definitely recognized by several authors. Drejer et al. (1998) indicate that there is a particular tradition of case research in Scandinavia, where is widely used in such research. Furthermore, case research is widely used in other management disciplines, notably organizational behavior and strategy.

In this study, the objective of the study is complex, including three different levels of analysis, the strategic, operational and individual level. Case study analysis resulted to be the appropriate research methodology to investigate the research questions, due the necessity to investigate the phenomenon in its specific context, as regards the company life cycle stage and the competitive environment in which it operates.

Then a multiple qualitative case studies analysis was conducted. Yin, 2003 also favors the use of multiple cases with the argument that the evidence from multiple cases makes the overall study more robust. Furthermore, case research gives researchers the possibility to collect data with a greater accuracy and reliability than in survey research, where respondents are usually left interpreting the information required. With case research original data sources are directly accessed (even by secondary data).

The data are collected from published sources, case studies from ECCH database and leading academic and managerial journals, companies financial statements, trade press, companies' website and documentation gathered during international conferences, and interviews published on the web (official companies' website, international renowned blogs⁷, and LinkedIn groups of professionals⁸). This method allowed the capture of data rich in detail about the research problem, and gave the possibility to compare the reliability and consistency of the information gathered through the different sources, so as to avoid sharing the same weaknesses. Reliability of data will be actually increased if multiple sources of data on the same phenomenon are used, as suggested by the triangulation of sources, using and combining them to study the same phenomenon, as recommended by Cook and Campbell, 1979; Campbell and Fiske, 1959; Jick, 1979 cited in Voss et al., 2002.

This aligns with Eisenhardt's (1989) description of the recursive analysis and theory building process. As part of the cross-case analysis, a comparison with the literature occurs and as Eisenhardt (1989) noted, the purpose of this process is to build confidence in the findings by providing explanations from the literature and where relevant, identify and

⁷ For detailed information see Exhibit 1. List of blogs, p. 160.

⁸ For detailed information see Exhibit 2. List of LinkedIn professional groups, p. 161.

discuss conflicting literature in order to refine theory. A qualitative approach according to Bygrave (1989) encourages the development of practical and theoretical understanding, as well as the generation of new and alternative theories or concepts.

Table 9. Research methodology of the study

Phase	Objective	Research method
Exploration phase	Identify missing elements in the existing research literature Develop research ideas and questions that are worth pursuing further	Literature review
First data gathering	Refine the research objectives and key questions	Focus groups Informal conversations with executives Attendance at meetings and seminars Online group discussions (LinkedIn, renowned blogs)
Research protocol design	Analyze the key elements of the phenomenon studying a typical representative case Design of the research framework and protocol Define variables and key factors of the study	Single in-depth case study
Sample building and selection	Defining the criteria to create a long list of companies considered for the study Define the criteria for selecting the cases to be analyzed	Public report analysis Literature case studies review Triangulation of multiple data sources
Data gathering and coding	Collecting data from multiple sources consistent with the research protocol Analyze in depth the criticalities and the key factors of the investigated cases, as suggested by the research protocol	Public report analysis Literature case studies review Triangulation of multiple data sources
Data analysis (within each case and cross-case)	Sum up and conclusion	

Hence, in this research case studies usefully add to the stock of knowledge about networked and open innovation, and are particularly helpful in identifying its moderating and contingent conditions, as an attempt to contribute to understanding the range of factors

that affect the phenomenon studied. In addition, the use of multiple cases also contributed to the reliability and consequent generalization of the findings (Brannick and Roche, 1997).

The number of cases selected depends on the research aims and the point at which theoretical saturations is reached. According to Miles and Huberman (1984), a multiple case study provides greater explanatory power than a single case study, since by comparing sites or cases, one can establish the range of generality of a finding or explanation, and, at the same time, pin down the conditions under which that finding will occur.

Due to the fact that the study wants to build a new theory predicting similar results found in the pilot case in other advisably selected cases (literal replication, following the definition of Eisenhardt, 1989, Miles and Huberman, 1994 and Yin, 1994), the number of case developed is three.

4.3 Sample building and selection

In order to identify suitable candidate companies for this study, several published innovation rankings have been considered. In addition, other qualitative and descriptive reports were considered, mentioning particularly pro-active companies in relation to their innovation processes.

The 2010 most innovative companies rankings finally considered are briefly described below. All the rankings are annually compiled, taking into consideration the last three years of companies' financial performances, whenever possible.

In addition a renowned blog has been considered during the sample building stage, 15inno by Stefan Lindegaard, that connects innovation leaders through peer-to-peer networking groups and learning sessions (available at www.15inno.com or in LinkedIn Leadership+Innovation group). Five interviews with open innovation and strategic alliances experts, including Lindegaard, have been conducted during the first Open Innovation Summit, Orlando, Florida in December, 2009. A discussion group has been created after the meeting, helping researchers and practitioners with their challenges and issues on innovation management and open innovation emerging strategies. The last database used in

combination with the most innovative companies ranking has been then created combining case studies literature review and web resources of companies that have declared an open innovation or crowd sourcing-like initiatives in their corporate websites (see also Lindegaard, 2010, or the list published at <http://www.15inno.com/2010/03/02/open-innovation-examples-and-resources/>, accessed November 24, 2010).

The global innovation 1000: how the top innovators keep winning, Booz & Co.⁹

According to most recent Booz & Company's annual study of the world's biggest R&D spenders, the most innovative companies are not those that spend more on R&D but those that effectively combine talent, knowledge, teams' structure and processes to enable their innovative efforts to launch successful product on the market and obtain superior financial performances. The ranking is based on a survey on critical success factors for the innovation and includes a section in which respondents are asked to mention the three most innovative companies in their opinion. The study shows that outperforming companies are able to identify their own key innovation capabilities that generate differential competitive advantage and correctly exploit them in a networked environment. This ranking is consistent with the study framework and helped in the identification of the candidate companies for the sample selection.

The 50 Most Innovative Companies 2010, Business Week¹⁰

The Most Innovative Companies Rankings, an annual report prepared by BusinessWeek in partnership with The Boston Consulting Group is derived from an annual innovation survey. The survey includes the 1,500 largest companies in the world, as measured by market capitalization and is directed toward the ten highest ranking executives

⁹ Jaruzelski, B. & Dehoff, K., 2010. The global innovation 1000: how the top innovators keep winning. Strategy + Business, Winter, Vol. 61. Available at http://www.booz.com/global/home/what_we_think/featured_content/innovation_1000_2010 [Accessed November, 2010].

¹⁰ Available at http://www.businessweek.com/interactive_reports/innovative_companies_2010.html [Accessed November, 2010].

in charge of innovation at each company. Along with several general questions regarding innovation, respondents are asked to name the most innovative company outside their industry. Companies are then ranked by the number of votes they receive.

The methodology is qualitative, but confirms the perceived innovativeness of a company, consistent with the study.

TR50 Most innovative companies, Technology review¹¹

To select the 50 most innovative companies in the world, the editors of Technology Review, published by MIT Massachusetts Institute of Technology, looked for those that over the last year have demonstrated their superiority at inventing technology and using it both to grow as businesses and to transform the way people live. They identified the companies that have the most promising technologies, aside from their size (large corporation, small and medium enterprises and even start-ups with initial venture capital investments). In their study, the authors examined the companies' business models, their strategies for deploying and scaling up their technologies, and the likelihood that they will succeed. This report is listing the most innovative companies, according to the authors, mainly based on the newness of the technology implied, and does not provide a formal ranking. This report was considered because, compared to the objective of this study, it analyzes and present elements that are comparable.

Most Innovative Companies 2010, Fast Company¹²

In selecting the companies worthy of the "world's most innovative" designation, *Fast Company*'s editorial team analyzed information on thousands of businesses across worldwide. Beyond revenue growth and high profit margins, they seek to recognize companies with creative models and progressive cultures that define innovation across the business landscape.

¹¹ Available at www.technologyreview.com/tr50 accessed November 24, 2010

¹² Available at <http://www.fastcompany.com/mic/2010> accessed November 24, 2010

The rankings were compiled on the basis of a survey conducted among senior executives from across the world and the financial parameters like stock returns as also revenue and margin growth of the companies over a three-year period.

Table 10 summarizes the sources of the innovation rankings considered and the methodologies implied.

Table 10. The 2010 most innovative companies' rankings

Ranking	Edited by	Methodology
The 50 Most Innovative Companies, 2010, Business Week	Bloomberg BusinessWeek/Boston Consulting Group	Survey, 21-question poll to senior executives worldwide. 1590 respondents, who named the most innovative companies outside their own industry in, 2009
TR50, 2010: the world's most innovative companies	Technology review	Case study of companies with superiority at inventing technology.
The global innovation 1000: how the top innovators keep winning	Booz & Co.	Survey Respondents indicate three most innovative companies
Most Innovative Companies, 2010	Fast Company	Survey conducted among senior executives worldwide and the financial parameters of the companies over a three-year period

The complete lists of the Most innovative companies, 2010 are reported in Exhibit 3, 4, 5 and 6.

The selected case studies are mentioned at least in two different innovation ranking or list, face a highly dynamic competitive environment, are in the mature phase of their life-cycle and are leader in their industry. In addition, combining the information available from public financial statement and official websites they declare to use collaboration to increase the performances of their innovation processes. Table 11 provides a brief summary of the long list candidates companies with the collected information.

Table 11. Data collection for sample building and selection*

Company	BW-BCG	Fast Co.	Booz & Co.	Tech50	15inno	Specific initiatives for collaboration (and dedicated official website)
IBM	4	18	8	*	*	IBM Collaboration Jam https://www.collaborationjam.com/
General Electric	9	19	4	*	*	General Electric Ecomagination http://www.ecomagination.com/
Apple	1	3	1	*		Apple Developer http://developer.apple.com/
Google	2	4	2	*		Chromium http://www.chromium.org/Home
Intel	12	14	10	*		Intel Open Lab + Ireland Innovation Open Lab http://www.intel.com/en_XE/intel/technology/labs/index.htm
Amazon	6	2		*		
Hewlett-Packard	16	10			*	HP Labs Open Innovation Office http://www.hpl.hp.com/open_innovation/
Procter & Gamble	25		7		*	P&G Connect+Develop http://www.pgconnectdevelop.com
BMW	18	25			*	BMW Virtual Innovation Agency http://www.bmwgroup.com/via/
Cisco Systems	31	17			*	Cisco I-Prize http://www.cisco.com/web/solutions/iprize/index.html
Samsung Electronics	11	36	9			SISA – Samsung Open Innovation R&D Center http://www.sisa.samsung.com/open.htm
Microsoft	3	48	6			Microsoft Research Connections http://research.microsoft.com/en-us/collaboration/about/default.aspx
HTC	47	31		*		
GlaxoSmithKline				*	*	https://innovation.gsk.com/gsk/ctx/noauth/PortalHome.do
Medtronic				*	*	http://www.medtronic.com/innovation/idea-submission/index.html
3M			3		*	http://www.zukunft-innovation.com/ (in German)
Huawei		5			*	http://www.huawei.com/partners/seeking_partners.do
First Solar		6		*		
LG Electronics	7				*	Collaborate & Innovate http://www.collaborateandinnovate.com/ci/main.jsp

Toyota Motor	5	5	Toyota Ideas for Good http://www.toyota.com/ideas-for-good/
Hulu	11	*	
Netflix	12	*	http://www.netflixprize.com/
Ford Motor	13	*	Ford Story http://www.thefordstory.com/your-ideas/
BYD	8	16	
Nokia	23	*	http://research.nokia.com/openinnovation http://betalabs.nokia.com/
Synthetic Genomics	26	*	
Wal-Mart Stores	21	9	
Siemens	34	*	http://siemens-enterprise.force.com/openideas
Dell	35	*	Dell Idea Storm http://www.ideastorm.com/
Nestlé	36	*	http://www.nestle.com/NestleResearch/GlobalRnD/OpenInnovationAndPartners/OpenInnovationAndPartners.htm
Athenahealth	43	*	
Facebook	48	1	Facebook for Developers http://developers.facebook.com/
Twitter	50	*	API Wiki for Developers http://apiwiki.twitter.com
Walt Disney	32	20	Disney, NBC & News Corp. http://www.dslreports.com/shownews/Rift-Between-Hulu-NBCComcast-Widens-112568
Nike	46	13	The GreenXchange http://www.greenxchange.cc/
Fast Retailing	27	41	

*BW-BCG=Business Week/BCG ranking, Fast Co.= Fast Company ranking; Tech50 = Technology Review ranking; Booz&Co. = Booz & Company annual ranking; 15inno = Stefan Lindegaard blog. For Tech50 and 15inno the * indicates the presence of the company in the list (there is not ranking). The columns indicate the relative position of the company in the specified ranking. All websites have been accessed November, 2010.

Procter & Gamble was selected as pilot case, due to the consistent literature developed on this case. Some of the articles published are edited by the changing agents towards the new business innovation model Connect & Develop: Alan Lafley, P&G CEO in the first, 2000s, Nabil Sakkab senior vice president P&G Corporate Research and Development, and member of the P&G Leadership Council (previously senior vice president for R&D Fabric & Home Care) and Larry Huston, vice president of innovation at Procter & Gamble Company that led P&G's "Connect + Develop " open innovation

strategy. Previously, he was the innovation leader for P&G's worldwide Fabric and Home Care business and has led the development of P&G's transnational R&D strategy.

These sources are combined, as described before, with official Annual report, academic publications, published interviews, and comments from managers at conferences and virtual groups.

The P&G case allowed the design of the research protocol to be applied to the case studies investigated in the research data collecting stage.

4.4 Pilot case: P&G's Connect and Develop

P&G is one of the world's largest and most successful consumer packaged goods company, headquartered in Cincinnati, Ohio, United States. The Company has one of the strongest portfolios of trusted, quality, leadership brands¹³ and is constantly looking for brand growth (Swasy, 1994; Dyer et al., 2004).

P&G has a net sale of \$ 78,9 billion, with 127,000 employees working in more than 80 countries in the world¹⁴. The Company's products are sold in more than 180 countries primarily through mass merchandisers, grocery stores, membership club stores, drug stores and high-frequency stores, and the neighborhood stores, which serve many consumers in developing markets. P&G is a publicly owned company and its stock is listed and traded on the New York and Paris exchanges.

The current organizational structure is comprised of three Global Business Units (GBUs), along with Global Operations, Global Business Services (GBS) and Corporate Functions (CF). Its three Global Business Units are Beauty and Grooming, Health and Well-Being, and Household Care. The primary responsibility of the GBUs is to create

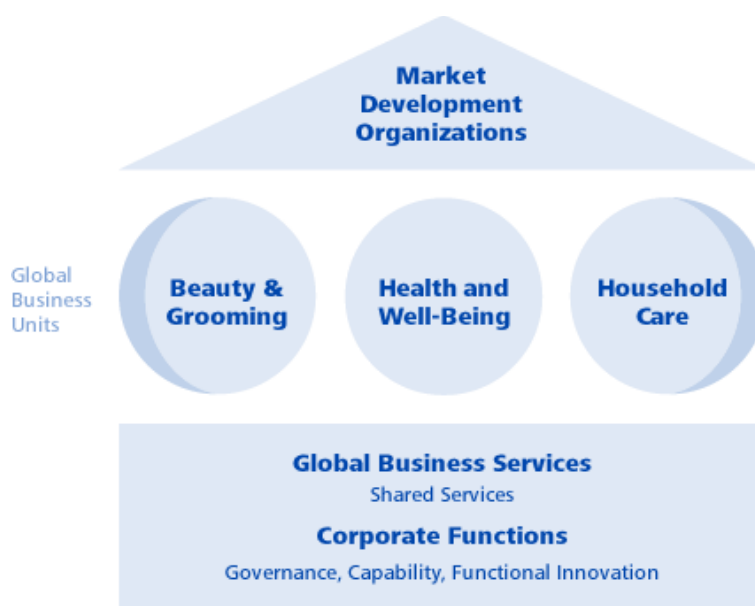
¹³ Including Pampers®, Tide®, Ariel®, Always®, Whisper®, Pantene®, Mach3®, Bounty®, Dawn®, Gain®, Pringles®, Charmin®, Downy®, Lenor®, Iams®, Crest®, Oral-B®, Duracell®, Olay®, Head & Shoulders®, Wella®, Gillette®, Braun® and Fusion®

¹⁴ P&G Annual Report, 2010, accessed November, 2010

strong brand equities, robust strategies and ongoing innovation in products and marketing to build major global brands, with a global perspective.

Global Operations is comprised of Market Development Organizations (MDOs), which are responsible for developing go-to-market plans at the local level. Global Business Services (GBS) provides technology, processes and standard data tools to enable the Global Business Units and the Market Development Organizations to better understand the business and better serve consumers and customers. Lastly, Corporate Functions (CFs) ensure that the functional capability integrated into the rest of the company remains on the cutting edge of the industry, providing company-level strategy and portfolio analysis, corporate accounting, treasury, external relations, governance, human resources and legal, as well as other centralized functional support.

Figure 13. P&G Corporate structure



Source: www.pg.com

Innovation has always been a strategic goal, and due to the fact that the market in which it operates is extremely competitive, mature, and global, P&G is continually searching for new, innovative ideas.

In fiscal, 2010, for the fourth consecutive year, P&G invested nearly \$2 billion in Research & Development, about 50% more than their closest competitor (Unilever), and equal to the combined total of its other major competitors—Avon, Clorox Company, Colgate-Palmolive Company, Energizer Holdings, Henkel, Kimberly-Clark, L'Oreal, and Reckitt Benckiser¹⁵. This leadership level of investment is multiplied by a global network of external innovation partners. P&G is today recognized to be one of the largest holders of United States and global patents.

The company experienced a strong organizational and cultural change around the end of last century, when the rate of innovation required was no more affordable with their internal existing innovation model. In the late 90s P&G's management recognized that to meet sales growth targets its innovation rate would need to increase significantly and the increasing cost of investments in R&D, technology and innovation were no more sustainable compared to the sales growth. As the world's innovation landscape had changed, P&G had to transform its innovation model that worked well for more than, 20 years, moving from a centralized approach to a globally networked internal model.

Alan Lafley, P&G CEO remarked "*It was clear to us that our invent-it-ourselves model was not capable of sustaining high levels of top-line growth.*"

The company was in a mature stage and its internal resources are not sufficient to maintain its rate of innovativeness, so it has to scout external sources of innovation to be combined with internal capabilities and competencies.

¹⁵ Datamonitor, The Procter & Gamble Company. Company Profile, Published on 27 Jul, 2010

Table 12. P&G at a glance

Global Business Unit	Reportable Segment	Categories	Billion-Dollar Brands	Net Sales by GBU* (in billions)
Beauty & Grooming	Beauty	Cosmetics, Female Antiperspirant and Deodorant, Female Personal Cleansing, Female Shave Care, Hair Care, Hair Color, Hair Styling, Pharmacy Channel, Prestige Products, Salon Professional, Skin Care	Head & Shoulders, Olay, Pantene, Wella	\$19.5
	Grooming	Beauty Electronics, Home Small Appliances, Male Blades and Razors, Male Personal Care	Braun, Fusion, Gillette, Mach3	\$7.6
Health and Well-Being	Health Care	Feminine Care, Gastrointestinal, Incontinence, Rapid Diagnostics, Respiratory, Toothbrush, Toothpaste, Water Filtration, Other Oral Care	Always, Crest, Oral-B	\$11.5
	Snacks & Pet Care	Pet Care, Snacks	Iams, Pringles	\$3.1
Household Care	Fabric Care and Home Care	Additives, Air Care, Batteries, Dish Care, Fabric Enhancers, Laundry, Surface Care	Ace, Ariel, Dawn, Downy, Duracell, Gain, Tide	\$23.8
	Baby Care and Family Care	Baby Wipes, Bath Tissue, Diapers, Facial Tissue, Paper Towels	Bounty, Charmin, Pampers	\$14.7

Source: www.pg.com

The origins of the P&G new model of innovation Connect and Develop

In June, 1999, P&G launched a new strategy to increase growth through innovation called *Organization, 2005*. One of the main objectives of *Organization, 2005* was to stimulate innovation by transforming P&G's internally focused and fragmented communications into more interconnected, focused and cohesive.

P&G's strategy for growth through innovation, and for create innovation through building connections is not so new. Rothwell fourth and fifth generation of innovation models (1994) describes a comprehensive innovation system that involves competitors, suppliers, customers, distributors and other partners and stakeholders where knowledge flows and learning processes are shared cross-boundary.

The novelty in P&G is related to the organizational practices and technological tools that supported the implementation of its effective networked innovation system.

In a large, globally dispersed organization, like P&G, competencies are distributed in people and research centers all around the world. Creating critical cross business connections that were the origins of many innovative ideas in P&G became a big challenge as the company grew and became more decentralized.

These knowledge exchanges were previously physically performed at the Miami Valley Laboratories lunch table. Due to the worldwide dispersion of researchers, working at several technical centers worldwide, innovating across different Global business Units and Corporate Functions, these critical connections were not even more efficiently created.

Hence, during the, 1980s, P&G adopted an initial internal networked model of R&D, with decentralized research activities around its key global markets (Bartlett and Ghoshal, 2000). The company needed to create and efficiently manage connections not only with the internal network, but also connecting internal people and knowledge with external sources of new ideas.

The aim of the *Organization, 2005* program was to create an organization that would access external resources to be combined with internal core competencies, and to change the P&G's culture in order to encourage and facilitate searching outside of the company for innovations. P&G was, in fact, traditionally protective about its patents and

wary of licensing them to outsiders, but less than 10% of P&G technologies were being used in products (Sakkab¹⁶, 2002).

This new collaborative R&D was not fully implemented yet, when the company thought about the adoption of a new collaborative innovation model, called Connect & Develop. Connect + Develop was launched in, 2001 with the goal of delivering 50% of the Company's innovation through external collaboration. The innovation performance measurement system rewarded the speed of the process and ideas coming from outside.

“Innovation is all about making new connections. Most breakthrough innovation is about combining known knowledge in new ways or bringing an idea from one domain to another”, said Dr. Mike Addison¹⁷, Procter & Gamble Associate Director R&D.

At that time, P&G employed more than 7,500 R&D staff. P&G was aware of the potentiality of its proprietary internal network. Most of P&G's best innovations had come from connecting ideas across internal businesses. Based on the successful performances of a small number of products generated by the contribution of different internal labs, P&G realized that the process could have been replicated with external connections too that could produce highly profitable innovations.

The cultural leap was well stated by Alan G. Lafley, the CEO of P&G at that time: *“We needed to move the company's attitude from resistance to innovations "not invented here" to enthusiasm for those "proudly found elsewhere." And we needed to change how we*

¹⁶ Nabil Sakkab was senior vice president. Corporate Research and Development, and a member of the Leadership Council, at Procter & Gamble when he retired from the company in November., 2007. He assumed his last responsibilities in, 2005, after nine years as senior vice president for R&D Fabric & Home Care. He joined P&G in, 1974 after receiving his doctorate in chemistry from the Illinois Institute of Technology and post-doctorate studies at Texas A&M. He is the author of several scientific publications and a co-inventor on several patents in detergency and toothpaste preparations.

¹⁷ Connect and Develop Symposium in February, 2003, reported in Dodgson, Gann and Salter, 2006. Mike Addison, become P&G New Business Development Director, said *“P&G now incorporates into our innovation a much greater desire to collaborate with people outside Procter and Gamble.... We want to keep growing at the rate that we have historically been growing. When you get to be the size that we are, continuing to do that on an internal basis really makes no sense”*

defined, and perceived, our R&D organization - from 7,500 people inside to 7,500 plus 1.5 million outside, with a permeable boundary between them.”.

The idea of the new strategic approach is simple: “Connect” to external source of new ideas, technologies, knowledge, prototypes or products that are interesting for P&G business and “Develop” those ideas into profitable new or refined products using internal P&G core capabilities, such as R&D, manufacturing, and marketing capabilities.

External sources of new ideas may come from university and government labs, web-based talent markets, suppliers, competitors, retailers, development and trade partners, venture capital firms, and individual entrepreneurs.

This new approach would have required for new skills in addition to the existing ones. Internal R&D personnel were fundamental for the growth objective: researchers have to maintain their capability of internal invention and development, and develop the scouting and evaluating capability for external ideas, in order to have a successful Connect and Develop process. *“They need to be extroverted, to be comfortable with collaboration, and they need to have both a technical and business mindset. They need to be entrepreneurial, which means being quick in identifying the opportunity, running the experiments and then closing the deal.”* said Sakkab in an interview published on Research Technology Management, 2007)¹⁸.

The effective implementation of the Connect & Develop strategic model requires first of all a focused search. Clearly define targets orient towards effective searching for the source of innovation required.

Actually, P&G looks for working products, prototypes, or proven technologies, packages that would benefit specifically from the application of P&G core capabilities (for instance, technology, production, marketing, distribution) and that help P&G leverage its existing brand equity (through adjacencies¹⁹). P&G selects the external source of

¹⁸ Huston, L. & Sakkab, N., 2007. Implementing open innovation. *Research Technology Management*, 50, 2, pp. 23

¹⁹ P&G defines adjacencies as products or concepts that help it leverage its existing brand equity.

innovation that they can improve, scale up, and market, on their own or in partnership with other companies.

To better focus this search P&G requires each year to business division to list what top ten consumer needs will drive the growth of their brands, strengthening the link between what is in the pipeline of the R&D processes and the most likely market profitable solutions. There is also a list for the company as a whole. Another useful tool to focus the search for ideas is the technology game board: this is a tool that maps the evolution of different technologies and how these developments affect products in other categories (technologies roadmaps).

Then, the need lists are developed into science problems to be solved, through technology briefs. A technology brief defines the problems the company needed to solve, and it circulates throughout the global networks of individuals and institutions to discover if anyone in the world had a ready-made solution. In short, R&D has to finding out if there is a similar solution to a specific problem on the market. Only if it does not exist the solution could be invented internally "from scratch".

P&G organize its network in two main parts: the proprietary network, specifically designed, managed and controlled by P&G itself, and open networks, that create a permeable interaction with external unknown researchers, firm, individual, as potential sources of innovation.

The strategic, organizational and cultural changes that Connect and Develop required have not occurred at once. According to many influential managers, increased external search activities have required a significant cultural change (Dodgson, Gann and Salter, 2006).

“[...] networks themselves don’t provide competitive advantage any more than the phone system does. It’s how you build and use them that matters.” (Huston²⁰ and Sakkab, 2006).

²⁰ Larry Huston was vice president of innovation at Procter & Gamble Company, headquartered in Cincinnati, Ohio. He led P&G's "Connect + Develop " open innovation strategy. Previously, he was the innovation leader

The open innovation model was different from the traditional P&G practices to outsource innovation that was contracting with outsiders to develop innovations for P&G.

The attractiveness of open innovation as a business strategy for P&G is the way it leads to exploiting the benefits from imported ideas from outside the firm and exporting intellectual capital that had until then been idle. The model brought also new forms of finance enabling P&G to become more entrepreneurial, supporting start-up businesses through new venture funds, with its corporate business incubator FutureWorks²¹.

FutureWorks is P&G's entrepreneurial new business generator. It aims to transform infant businesses serving new market niches into businesses that can scale to serve the mass market, through P&G's global key manufacturing and marketing competences.

The innovation networks

The proprietary network is constituted by P&G researchers spread around globally distributed R&D labs.

In order to re-create the exchange and connections among researches' ideas and solutions, P&G created a *Global Technology Council*, which comprises its business-units technical directors, corporate heads, key geographical R&D leaders representing the competencies of the company. The council explores how to leverage P&G technologies and act as an "incubator" for exploratory research and early-stage product development (Sakkab, 2002). Another important vehicle for making connections across P&G Business Units are the *Communities of Practices* (CoP), supported by P&G R&D senior managers and nominated by the Chief Technology Officer. Communities of Practices represent a shared interest across the whole company and aim to promote cross-fertilization and diffusion of expertise, through active problem solving, knowledge sharing and active seeking of both internal and external expertise.

for P&G's worldwide Fabric and Home Care business and has led the development of P&G's transnational R&D strategy.

²¹ Further information about P&G business incubator FutureWorks are available at <http://futureworks.pg.com>, last accessed November 25th, 2010

One of the most important external sources of capability to be developed by P&G is the *Technology Entrepreneurs Network*. This is an extended network of 70 senior P&G people who aggressively scan the market and help link P&G to external innovation opportunities. The technology entrepreneurs are scientists and specialists in the technology needs of one of P&G's Global Business Units. The internal network of technologists seeks external source of innovation, through "Connect and develop hubs" located in China, India, Japan, Western Europe, Latin America, and the United States. Each hub focuses on the search of products and technologies that are a sort of specialty of the region in which it is located. The China hub, for example, looks in particular for new high-quality materials and cost reduction innovations or the India hub exploit the local talent in the science of computer modeling in order to solve problems, for example, in manufacturing processes.

Technology Entrepreneurs are expert data mining specialists that use the most advanced data mining visualization tools to search billions of web pages, scientific literature and databases and global patent databases, local stores, etc. They map consumer needs and create adjacencies maps and technology game boards, as described before. To date they have identified more than 10,000 products, product ideas and promising technologies (Huston and Sakkab, 2006).

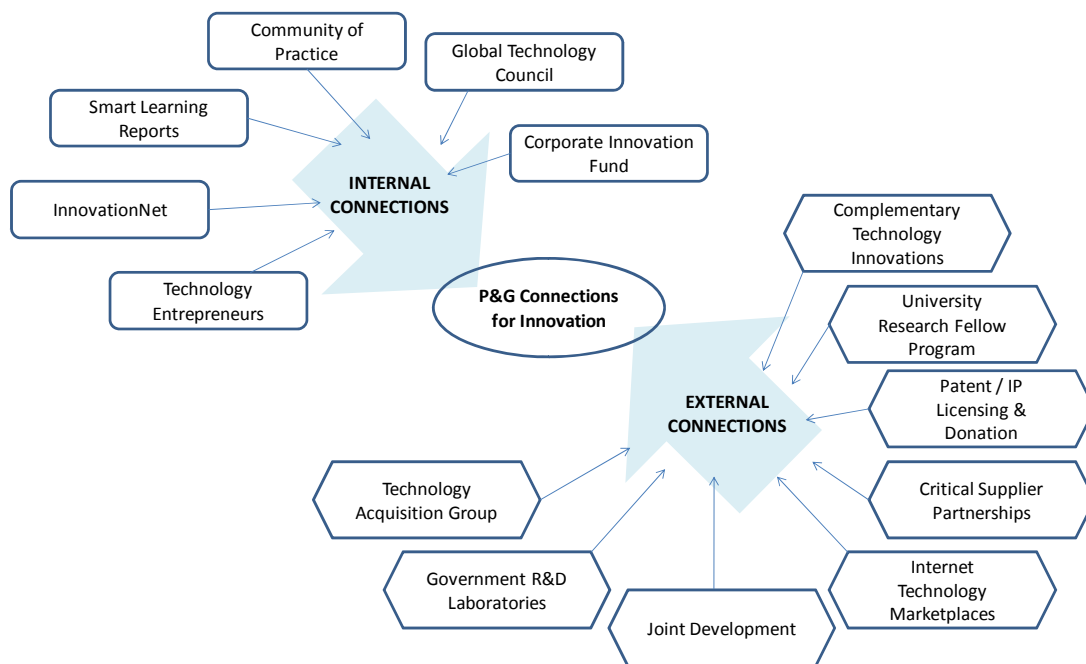
In contrast with its past closed innovation and "invent it ourselves" model and high-level control culture for new product development, the new P&G culture is prepared to bring ideas from outside sources, using entrepreneurial strengths of small and medium sized companies, sometimes buying them such as in the case of Crest Spin-Brush (a low cost electric tooth brush) and acting as an "incubator" through *internal seed funds*, providing seed funding between \$20,000 and \$50,000 for innovative new ideas (as, for instance, occurred in the case of Pur Sachet).

In addition, leveraging on the Information and Communication Technologies, P&G created an internal website that act as a documentation platform, the "*InnovationNet*", to globally connect researchers, engineers, market researchers, purchasing people and patent divisions, trade information and automatically suggest reading material depending on user's interests. Tracking the information posted or searched by users InnovationNet suggest also connections with people with similar interests (with an automatic algorithm of artificial

intelligence). *Smart Learning Reports* feeds the documents shared on the platform and help researcher to share their ideas or problem briefs.

Sakkab claims that InnovationNet acts as P&G's 'global lunchroom'. Its value to P&G resides in its ability to accelerate innovation by allowing thousands of innovators across the globe to make new connections, collaborate with co-workers and cross-fertilize their knowledge in a variety of specialized fields. It also facilitates through extranet communication with external business partners and serves as a link to external databases (Sakkab, 2002). One of the purposes of these Internet-based systems is also to facilitate communications within (and between) 'communities of practice' (Brown and Duguid, 2000).

Figure 14. P&G internal and external connections for innovation



A complement of the proprietary network is the external innovation network that comprises established relationships or open innovation networks, reached thanks to *Internet Innovation Marketplaces*. In particular, P&G has been instrumental in creating and supporting a number of *web-based innovation intermediaries* which help link externally

sourced solutions to internal problems, such as InnoCentive, Yet2.com, NineSigma and YourEncore (Dodgson et al., 2005)²².

In order to increase the rate of the licensing-in of new complementary technologies and the licensing out of its own technologies to increase its returns on investment P&G has created a specific organizational structure: the *Technology Acquisition Group* (TAG). The group was created to actively seek out new technologies and products in order to access complementary technologies that would be added to P&G intellectual property portfolio. It actually can be intended as the first "portal" for soliciting external technologies.

A strong potential to innovate is also represented by strategic (top) P&G's suppliers. Technology briefs are shared with them through an ad hoc secure *IT document platform*, in which suppliers are connected but cannot visualize the solutions posted by other suppliers.

Comparing to the outsourcing practices of the past, a more collaborative and open approach with a selected number of strategic suppliers is the "*Critical Supplier Partnership*" to jointly develop new product and processes. The relationship could be either dyadic or open to several suppliers, under the terms of a Master Collaboration Agreement that establishes the principles for sharing projects risks and rewards, defining intellectual property and exclusivity rights within a broad framework of principles. This general agreement saves precious time in the early negotiation phase that generally characterizes each individual project of joint development with an external partner.

The new patent strategy pursued by the Technology Acquisition Group became from "protective" to "proactive". Patents could be licensed for fees or royalties. P&G sells,

²² Through NineSigma P&G was able to identify and disseminate problems to several solution providers worldwide. These solution providers were required to submit their project proposal to P&G and those which were beneficial to P&G were selected and NineSigma was used to connect the company and the solver by proceeding with the project. Through NineSigma, P&G distributed technology briefs to 700,000 people and completed 100 projects, out of which 45% led to further collaboration. Using Innocentive, P&G managed to solve one third of its problems. Furthermore, P&G is the founding sponsor of Yet2.com, P&G's first B2B equity investment (Sakkab, 2002). Thanks to Yet2.com P&G was able to license its low cost micro needle technology to a company specializing in drug delivery. For further details about innovation intermediaries and technology brokers refers to chapter3.4, p.48.

donates, swaps or collaborates with suppliers patents that otherwise remain unemployed “on the shelf”, or uses IP also to minimize its litigation costs.

Other potential joint development program can be created with government laboratories or University research centers. P&G also run an innovation portal (www.pgconnectdevelop.com) in five languages (English, Japanese, Chinese, Spanish, and Portuguese) for idea submissions.

Once external entrepreneurs find out a technology, they fill in a P&G template to evaluate the level of interestingness for P&G of their submitted idea. If the idea pass the evaluation, the *External Business Development* (EBD) get involved. The External Business Development group (EBD) start a thorough, deliberate, confidential process of connecting with the owners of the ideas to learn even more. If there is a fit with P&G strategy, EBD contacts the product's manufacturer ad begins working through arrangements that will build win-win partnerships between P&G and the innovator (negotiating licensing, collaboration and other deal structure). So the product found outside has entered the in-house pipeline of P&G new product development process.

Procter and Gamble’s radical strategy of open innovation, with its Connect and Develop (C+D) program and mindset, enabled projects consistently delivered with greater efficiency, speed, value and market impact. Today, the C+D global Web site receives about 300 idea submissions a month from all over the world²³.

Through Connect and Develop - along with improvements in other aspects of innovation related to product cost, design and marketing - R&D productivity has increased by nearly 60%. P&G innovation success rate has more than doubled, while the cost of innovation has fallen (Huston and Sakkab, 2006). More than 50% of P&G innovations are currently sourced externally. 40% of Connect and Develop partners have multiple deals with P&G. External partnerships have delivered innovation across all areas of the

²³ Source: www.pg.com

Company, including break-through product innovations²⁴. Project enabled in, 2009 from Connect and Develop program demonstrated to have a higher net present value than average in 70% of cases. About \$3 billion in annual sales are driven by P&G-shared innovation.

"We believe that Connect and Develop will become the dominant innovation model in the twenty-first century", said Larry Huston, vice president of innovation at Procter & Gamble Company.

The next step of C+D

Bob McDonald, P&G Chairman of the Board, President and Chief Executive Officer, along with Bruce Brown, Chief Technology Officer, defined in October, 2010 two new goals for C+D program to accelerate P&G Innovation Process and create greater value through C+D partnerships:

- C+D to triple its contribution to P&G's innovation development by delivering \$3 billion toward the Company's annual sales growth, and
- P&G to become the Partner of Choice for innovation collaboration by consistently delivering mutual win relationships.

"Connect + Develop opened our minds and doors to external collaboration. It changed our culture from 'invented here' to 'partnering for greater value' [...]. We want

²⁴ Such as Olay® Regenerist, world's top selling skin cream; Olay® Rengerist Eye Roller, delivered in market in months; Olay's #2 global seller; Olay® Definity Eye Illuminator, packaging innovation wowed consumers, reapplied across other P&G brands; Swiffer Dusters®, market leader sold in 15 global markets; Mr. Clean® Magic Eraser®, sold globally, expanded with Erasers for varied cleaning needs; Clairol Perfect 10™, category breakthrough. Awards include:, 2010 Product of the Year, Consumer Survey of Product Innovations; Oral B Pulsonic® Toothbrush, to market in less than one year versus projected five; GLAD® Forceflex® and GLAD Press'nSeal®, P&G innovations shared with Clorox for mutual win; GLAD is now a Clorox Billion\$ Brand (Source: www.pgconnectdevelop.com, accessed November, 2010).

collaboration that creates innovation across all our business operations from product development to logistics.” said Chief Technology Officer Bruce Brown²⁵.

The new challenge is to accept, embrace and champion the C&D philosophy in order to build more win-win relationships. Among the core competencies that P&G could offer to their partners, there are manufacturing asset and supply chain management competencies that would allow small and medium enterprises or even individual researches to leverage their innovative ideas to a global scale.

The goal is to attract external partners, offering them the opportunity to leverage on P&G core competencies as well, creating greater value and scale up opportunity²⁶ than any other option available to them.

4.5 Research framework

Case study protocol and key variables

The Procter & Gamble pilot case highlighted the key variables that will be analyzed in the case studies investigated (see Table 13).

Table 13. P&G pilot case key variables and results

Company	P&G
Characteristics of the company (keywords)	Large, public and global company, with a strong and trusted brand, leader in its industry. High investment in R&D, strong patent portfolio. Looking for brand growth and sales growth through innovation.

²⁵ Procter & Gamble official YouTube channel, Bob McDonald and Bruce Brown C+D, available at: http://www.youtube.com/watch?v=0nKfcTgR5rQ&feature=player_profilepage, accessed November, 2010

²⁶ For further information see: External Business Development. Supply Chain Solutions, Reliability technology: manufacturing improvement, capital productivity solutions, www.pgconnectdevelop.com, available at: <https://secure3.verticali.net/pg-connection-portal/static/external/files/PG+Reliability+Brochure.pdf>, accessed November, 2010

Market and competitive environment	Extremely competitive, mature and global market
Starting situation	External innovation landscape changed and P&G innovation model was anymore able to ensure the mandate of growth. R&D costs are no more sustainable compared to the required sales growth.
Initiative	Organization, 2005 (1999); Connect and Develop, 2001)
Strategic goal	Reinvent the company's innovation business model: half of new products would come from internal labs, and half would come through them.
Sponsorship	A.G. Lafley, CEO and key top innovation managers
Expected outcomes	Improving the rate of profitable innovations leveraging from external sources and partners.
Antecedents	P&G was awareness of the potentiality of its proprietary internal network. Based on the successful performances of products generated by the contribution of different internal labs, P&G aims to replicate the process with external connections too.
New practices	<ul style="list-style-type: none"> - Improve the internal interconnection between R&D centers globally dispersed (creating cross business connections) - Create connections with external sources of innovation (C+D) to be integrated with the internal connections - Define the top ten consumer needs, adjacencies mapping, technology game board - need for focused search - Define a "Critical Supplier Partnership" program supported by "Master Collaboration Agreements" - Changing from IP "protective" to "proactive" approach - Create connections with web-based Innovation intermediaries and marketplaces - Solicit external technologies through the Technology Acquisition Group (TAG) <p>Start a thorough, deliberate, confidential process of connecting with the owners of the ideas through the External Business Development (EBD) group</p>
External source of innovation	University and government labs, web-based talent markets, suppliers, competitors, retailers, development and trade partners, venture capital firms, and individual entrepreneurs
External idea selection criteria	Working products, prototypes, or proven technologies, packages that would benefit specifically from the application of P&G core capabilities and that help P&G leverage its existing brand equity (through adjacencies) improving them, scale up them, and market them in partnership with other companies. Products or services that are frequently repurchased by consumers who are primary owners of the purchase decision that have the potential to generate sales in excess of \$100 million that will prove difficult to replicate and free from factors that could be subject to long regulatory delays.
Cultural change	From " <i>not invented here</i> " to " <i>proudly found elsewhere</i> "

Organizational change and actions implemented	Acquisition of entrepreneurial companies, Global Technology Council (GTC), Communities of Practices (CoP), Technology Acquisition Group (TAG), FutureWorks
New skills and capabilities	Continuous maintenance and improvement of the internal invention and development capability Development of an extroversion attitude Capability to be comfortable with collaboration, and develop both a technical and business mindset. Capability to be entrepreneurial, being quick in identifying the opportunity, running the experiments and then closing the deal.
ITC tools	Data mining visualization tools, scientific literature databases and global patent databases. Adjacencies maps and technology game boards InnovationNet (the "Global lunchroom") as a documentation platform, globally connecting researchers, engineers, market researchers, purchasing people and patent divisions, and automatically suggesting reading material depending on user's interests Smart Learning Reports to feeds the document sharing platform (ideas, problem brief and technology briefs)
Performance measurement system	Number of ideas submitted to P&G (monthly) Number of patents used in products (internally or licensed out) % of innovation deriving from external sources Average number of deals with a single partner turnover generated by P&G shared innovation Innovation success rate Innovation cost R&D productivity (technologies implemented in products)
Results	> 35% of the company's innovations and \$ bill revenue in, 2006 45% of the initiatives in product development portfolio have key elements that were discovered externally + 60% of P&G R&D productivity >, 200% of innovation success rate Reduction in the cost of innovation
Today's new strategic goals	\$3 billion annual sales growth deriving from external sources To become the Partner of Choice for innovation collaborative projects

In particular, the research protocol will aim to investigate why companies approach external sources of innovation, in which competitive situation, and how they reorganize their processes in order to increase their internal productivity and the effectiveness of their new product development processes. Lastly the study investigates what are the new capabilities required in the new approach and the cases support the definition of the new framework for dynamic innovation capabilities.

The P&G case allowed the design of the research protocol to be applied to the case studies investigated in the research data collecting stage. The key variables investigated in each case can be summed up in the following table (see table 14):

Table 14. The research protocols: key variables for the case studies

Company presentation	Company
	Starting situation
Strategy	Initiative
	Strategic goal
	Sponsorship
	Expected outcomes
Execution	Antecedents
	New practices
	External source of innovation
	External idea selection criteria
	Cultural change
	Organizational change and actions implemented
	New skills and capabilities
	ITC tools
Outcomes	Performance measurement system
	Results
Next steps	Today's new strategic goals

The three selected case studies are Cisco System, Inc., Nokia Corporation and Nestlé SA. The three companies are comparable with the pilot case P&G because they are large companies, facing mature market characterized by high competition, they are multiproduct, global company, have different R&D centers globally dispersed and need to grow at a high range leveraging on innovation. Their headquarter are based in different

countries (United States for Cisco, Switzerland for Nestlé and Finland for Nokia) in order to study the corporate culture, not specifically related with a particular country culture.

For each case, the sources are combined, in order to guarantee the triangulation process, with official annual reports, academic publications, published interviews, comments from managers at conferences and virtual groups.

5. Case studies analysis

In this chapter the cases are presented in depth in order to collect the needed information to study how companies organize their processes to innovate leveraging from external sources and which are the new dynamic capabilities they need to develop innovation in a networked system.

5.1 Cisco Systems, Inc.

Company overview

Founded in 1984, Cisco Systems (Cisco) pioneered the development of Internet Protocol based networking technologies. Cisco designs, manufactures and sells internet protocol based networking and other products for the communications and information technology industry. The company's products are used for the transmission of data, voice and video. The company's product segments are firstly divided into products and services and further sub-divided into four categories: routers, switches, advanced technology and other. Its major products include routers, switches, IP telephony and products related to network access, security, optical networking, storage area networking, wireless technology and home networking. Cisco primarily operates in the US, Canada and Europe and its products (and services) are used by corporations, public institutions, telecommunications companies, businesses and consumers.

It is headquartered in San Jose, California and employs about 65,550 people and has operations in North America, Latin America, Europe, the Middle East, Africa, and Asia Pacific. It has a strong market position in most of the market segments it serves. However, intense competition in the networking and communications equipment market will continue to adversely affect the company's market shares and margins.

The company recorded revenues of \$40,040 million during the financial year ended July 2010 (FY2010), an increase of 10.9% over 2009. The operating income was \$ 9,164

million in FY2010, an increase of 25.1% over 2009. Its net profit was \$ 7,767 million in FY2010, an increase of 26.6% over 2009 (Datamonitor, 2010; Cisco Annual Report 2010).

From hierarchy to networks

Cisco was traditionally managed in a traditional hierarchical way. This implied that every decision had to be taken by the CEO John Chambers, in consultation with about 10 other senior execs. Since 2001, turbulent competitive environment emphasized the need to make faster decisions: a structural change was needed from hierarchy to networks.

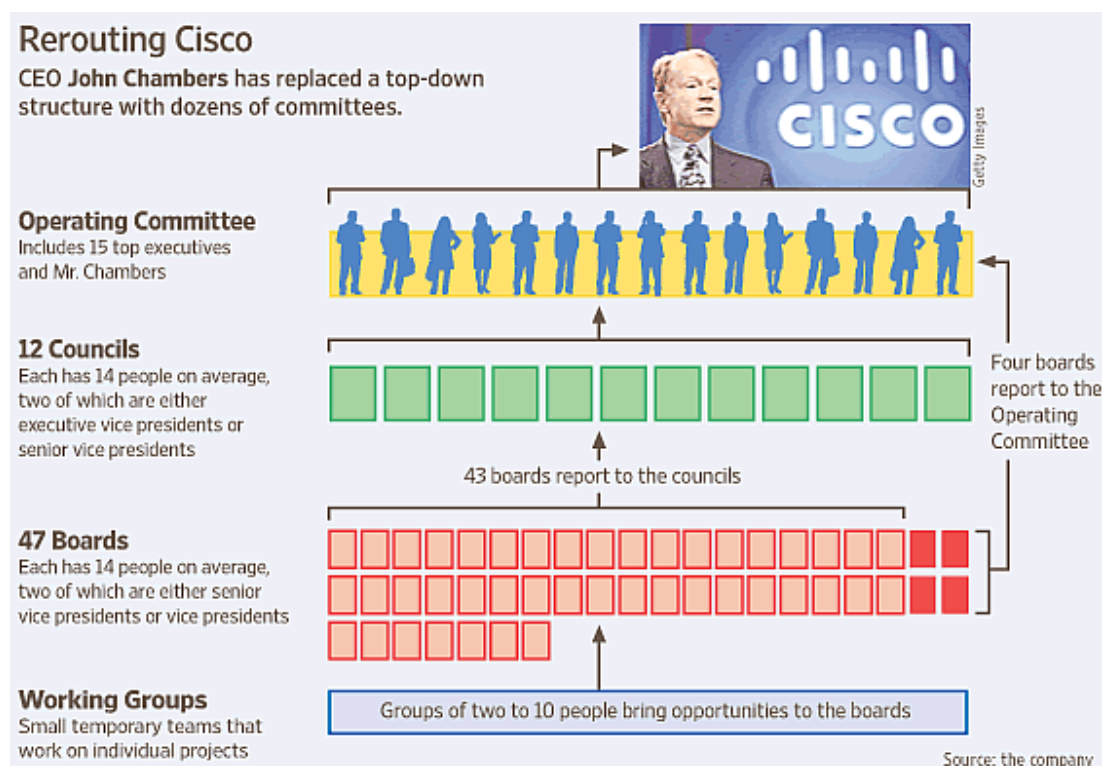
Its internal organizational structure (and culture) needed to be change in a more collaborative attitude, first of all internally and later with external potential partners.

The new organization was based on collaborative teams to accelerate the decision processes and so it was structured in councils, boards and working groups. John T. Chamber, Cisco's CEO, sponsored the initiative, explaining that "*[Cisco's] future is about collaboration and teamworks*" (BusinessWeek, 2009)

Ever since 1993, Cisco already installed an Internet-based system for large multinational corporate customers (technical and customer support service). After this, in 1996 Cisco introduced an internet initiative "Networked Strategy" to leverage on its enterprise network to foster interactive relationships with prospective customers, partners, suppliers and employees.

But the reorganization of 2001 has a huge cost in terms of internal acceptance: 20% of Cisco's top managers left after the changes began, unable or unwilling to adapt their management style. Mike Mitchell, director of technology communications, says, "*we want a culture where it is unacceptable not to share what you know*" (Linden, 2010). Cisco's leaders created a network of 500 boards, councils, and work groups that work on new products and processes. Chambers and other executives clarify their expectation that employees collaborate and share ideas freely: collaboration is an important element in annual appraisals. Reward systems is based on the success of Cisco's portfolio of businesses, not on the execs' own unit profits. This increases the importance of team performances, not individual results.

Figure 15. Cisco's new management structure



Source: Reese B., 2009, *Management vision of Cisco CEO John Chambers under fire*, 08/07/09, *Network World*, 2009, <http://www.networkworld.com/community/node/44218> [Accessed February 2011]

The new organizational structure: internal and external collaboration

Cisco is today recognized to employ collaboration in a very effective way, due the fact that partnerships account for 13 percent of the company's total business (AMA, 2006). Most of Cisco's technology is acquired from external sources without conducting its own R&D (Gassmann, 2006, cited in Asakawa, K., Nakamura, H. & Sawada, N., 2010).

Alliances have been a core part of Cisco since 1996, even though they are not easy to establish. Nevertheless alliances have been widely accepted in Cisco thanks to the effort of the CEO John Chambers that is actively involved in this process, especially in the incubation phase. As a consequence, a senior-level management supports alliance

relationships to: each alliance has an executive sponsor, usually a senior vice president, and part of these executives' success is tied to the success of the relationship.

The company's strategic alliance objectives and goals include technology exchange, product development, joint sales and marketing activities²⁷. Strategic alliances will enhance the competitiveness of the company as well as accelerate its expansion plans. To make the right decisions, whether acquire or ally, Cisco have centralized the corporate development function that includes M&As, alliances and technology incubator under the same person (Dyer et al., 2004).

Collaboration is enhanced internally and externally through a diffused use of technology, to invite easy, informal idea sharing. Mike Mitchell, director of technology communications, says, "we want a culture where it is unacceptable not to share what you know." (Linden, 2010).

Table 15. Cisco Systems Inc. collaborative innovation model

Company	Cisco Systems, Inc.
Characteristics of the company (keywords)	Strong market position in most of the market segments it serves. Expanding portfolio of offerings. Intense competition in the networking and communications equipment market. Lack of significant presence in the consumer market. Dependence on suppliers. Turnover (FY 2010): \$ \$40.0 bio. Employees: 65,550
Market / competition	High competition in several markets (especially for the strategy's growth in market adjacencies), global markets
Starting situation	Until 2001, Cisco was run in a traditional top-down hierarchical way: all important decisions were made by CEO John Chambers, in consultation with about 10 other senior execs. Turbulent environment and the need to make faster decisions: a structural change needed from hierarchy to networks.
Initiative	Collaborative organizational structure of councils, boards and working groups I-Prize for collaborative innovation
When	Reorganization in Councils-boards-committees in 2001, I-Prize in 2007

²⁷ Cisco has strategic alliances with Accenture, AT&T, BearingPoint, Capgemini, Dell, EMC, Fujitsu, Hewlett-Packard, Intel, IBM, Microsoft, Nokia, Nokia Siemens Networks, Oracle, Siemens, Sprint Nextel, Tata Consultancy Services and Wipro, among others (Datamonitor, 2010).

Strategic goal	Organizational structure based on collaborative teams to accelerate the decision processes. Leverage on external sources of ideas (the "global community" or "human network") to identify new business opportunity and improve Cisco's rate of innovation.
Sponsorship	CEO John T. Chambers " the future is about collaboration and teamwork"
Expected outcomes	Decreased time for decision taking (for collaborations, acquisition or new products/service business cases evaluation)
Antecedents	In 1993 Cisco installed an Internet-based system for large multinational corporate customers (technical and customer support service) In 1996 Cisco introduced an Internet initiative "Networked Strategy" to leverage on its enterprise network to foster interactive relationships with prospective customers, partners, suppliers and employees.
New practices	New organizational structure based on internal and external collaboration Delegated decision processes Through the use of Web 2.0 tools, thousands of Cisco employees are regularly communicating with people outside their units to discuss ideas and generate interest in new ventures (via a Facebook-like company directory, a number of wikis for tracking new business ideas) Networked virtual organization (NVO)
External source of innovation	Any external source of ideas (communities of innovators) for the I-Prize Adjacencies businesses for acquisition and partnerships programs
External idea selection criteria	The idea had to fit into the company's strategy and take advantage of Cisco's leadership position in internet technology 5 basic questions: 1) Does it address a real pain point? 2) Will it appeal to a big enough market? 3) Is the timing right? 4) If we pursue the idea, will we be good at it? 5) Can we exploit the opportunity for the long term, or would this market commoditize so quickly that we wouldn't be able to stay profitable? So we created three lists: a "people's choice" ranking based on voting, flawed as it was; a "most active" list of the ideas that had generated the most comments; and the ideas considered best by Cisco evaluators. External competition is a validation tool of ideas already investigated at Cisco.
Cultural change	Cost of the change: 20% of Cisco's top managers left after the changes began, unable or unwilling to adapt their management style Mike Mitchell, director of technology communications, says, "we want a culture where it is unacceptable not to share what you know."
Organizational change and actions implemented	Cisco's leaders created a network of 500 boards, councils, and work groups that work on new products and processes. Reward systems based on team performances (or BU, not individual performances) Crowd sourcing through I-Prize program

New skills and capabilities	Strong inventive capacity to internally arrive at technological breakthroughs and develop prior knowledge for absorptive capacity, in order to decrease the cost of external knowledge acquisition Collaborative mindset is the leadership characteristic most critical for dealing with the networked world of the 21st century.
ITC tools	Web 2.0 tools (wiki, blog, text, IM, and other communication tools) I-prize for crowd sourcing (technology platform supporting two forms of evaluative input: voting and comments). WebEx space to refine the ideas with the external inventor through the I-Prize platform TelePresence as remote HD video collaboration technology, IP TV, static video and PC-based video calls over the company's unified communications network architecture
Performance measurement system	Chambers and other executives make clear their expectation that employees collaborate and share ideas freely: collaboration is an important element in annual appraisals. Cisco also rewards executives on the success of Cisco's portfolio of businesses, not on the execs' own unit profits.
Results	(2007) After I-prize: more than 2,500 innovators from 104 countries submitted some 1,200 distinct ideas
Today's new strategic goals	Implement virtualization and enterprise collaboration technologies

Ideas are then generated formally and informally. The formal process involves the cross-functional councils, boards, and work groups. Through the use of Web 2.0 tools, thousands of Cisco employees are regularly communicating with people outside their units to discuss ideas and generate interest in new ventures (via a Facebook-like company directory, a number of wikis for tracking new business ideas, the employees own blogs and a system of voting on the most helpful blog posts, and uploading and watching each others' videos on a YouTube site within Cisco's firewalls, that describe their skills and knowledge areas) (Linden, 2010).

People need to develop their collaborative mindset and this requires practice, focus, and feedback. *"A collaborative mindset is the leadership characteristic most critical for dealing with the networked world of the 21st century. And because it takes time to grow, it has to be started today"* (Linden, 2010).

Web 2.0 tools literacy is also needed in order to better work in this new organizational environment.

External collaboration is pursued through different initiatives. In 2001, Cisco has adopted a new way of doing business, the networked virtual organization (NVO). *“An NVO responds rapidly to customers’ needs, putting the customer at the center of the value chain, not at the end. An NVO concentrates on those elements of functions where it adds the most value or has the greatest skills, and turns over to multiple partners who compete to provide those elements that are not core.”* (IBSG, 2003).

Networked virtual organizations (NVOs in short) have three key strategies (IBSG, 2003):

- customer-centricity, to rapidly respond to customers’ needs, and changes in customer demand, placing the customer at the center of the network, effectively making him a partner in the process, in opposition to a traditional value chain where the customer is put at the end of the process, making it difficult to respond to its changed needs in a timely manner;
- core versus context, to clearly and dynamically define what is core competence for the company and what is “context”, that is an element of the functions (i.e. “complementary cores”) that are required to deliver products and services, but are not core and, most of all, better performed by external partners. By partnering with other organizations that have complementary cores, an organization can achieve the benefits of industry scale and innovation that it could not achieve if it tried to do everything by itself, “out-tasking” the complementary activities²⁸.
- and continuous standardization, NVOs need to establish standard business processes inside their organizations as well as with partners on the outside. Creating a seamless web of partnerships to bring products and services to

²⁸ “When an NVO turns over an element of a function to a partner it plays a much more active role in defining and overseeing the function by using shared systems, hence the need for a new term to describe the process: out-tasking.” (IBSG, 2003)

customers can only happen when the information technology systems that each of the partners has are themselves integrated.

Figure 16. Networked Virtual Organization: core versus context dynamics at Cisco

	CORE Any activity that contributes to competitive advantage for the organization	CONTEXT Any activity that does not contribute to competitive advantage for the organization	
Mission critical Any activity that, if performed poorly, would pose an immediate risk to organization	FOCUS AND GROW Engage and control Continue in house	<i>Context transition applications</i> <i>Transition</i>	OUT-TASK Disengage and entrust Out-task and maintain a lot of control
Non-mission critical Any activity that, if performed poorly, would not pose an immediate risk to the organization	CONSTRAIN Disengage and entrust Out-task and maintain some control	<i>Disengagement</i>	OUTSOURCE Disengage and entrust Outsource and give up control

Networked Virtual Organization maturity →

Source: Adapted from IBSG, 2003

Cisco generally focuses its internal resources on those areas of each function or process that are core to differentiation and mission critical to the business, such as product design. As a process evolves, and as Cisco and the technology industry mature, activities may move from core to context, or from mission critical to non-mission critical.

For example, more elements of manufacturing are core at the beginning and externalized in mature phases. Cisco enables its partners to handle the out-tasking by sharing applications capabilities and data and process standards across its ecosystem²⁹.

²⁹ “Cisco created a network of 600 service partners, ranging from small firms in Brazil to large ones such as IBM, that send their own technicians out to the customer. Cisco forged tighter working relationships with logistics companies such as Federal Express and DHL to ship returns and spare parts. And Cisco teamed with

With its crowd sourcing initiative, the I-Prize, launched in 2007, Cisco extended its already existing internal ideas competition beyond its boundaries. The company has a strong track record of investing in start-ups or acquiring new promising firms to insource new technologies from the outside. Nevertheless with I-prize Cisco intended to introduce novel innovations that would entail significant long-term investments for Cisco in view of promising results in the mid-long term, as “seeds of potentially viable businesses” (Jouret, 2009). The winner of the competition would cede to Cisco the commercial rights to the idea in exchange for \$250,000.

Participants was registered in an idea-management platform from a company called Brightidea, whose tool allowed people to sign up, present their ideas, comment and vote on everyone else’s submissions, in a user-friendly way. From a legal standpoint participants have to attest the ownership of their IP, and, on the other side, to protect the company in cases where participants submitted ideas that Cisco was already working on, only the small team of Cisco judges had access to the ideas. The selection criteria for the submitted ideas are based on the consistency of the idea with a real problem for Cisco, the potential market size for the proposal, the appropriateness of the timing, the Cisco’s capability to effectively pursue the idea and the long term profitability against a quick market commoditization.

Three lists of evaluation are implemented: a “people’s choice” ranking based on voting; a “most active” list of the ideas that had generated the most comments; and the ideas considered the best by Cisco evaluators.

Selecting 40 ideas out of 1200, Cisco provides idea-incubation support to the finalists, assigning a mentor to work with each individual innovator or team to address the idea’s weaknesses and make the most of its strengths (six-week refinement phase). Each team was given a private WebEx space in which to collaborate, TelePresence³⁰ rooms around the globe, and an adapted version of a check-list that Cisco internally use as a business-plan template.

repair companies to receive, repair, and ship the refurbished parts directly to the service companies. Together, these companies manage more than \$300 million in inventory.” (IBSG, 2003)

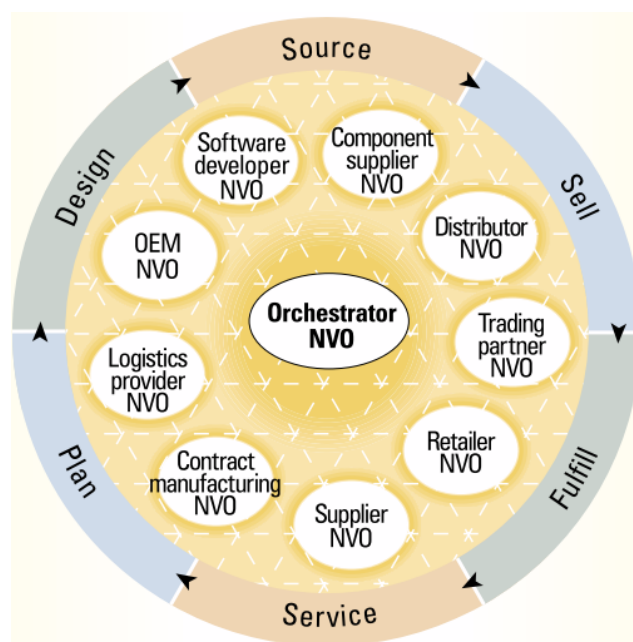
³⁰ TelePresence is Cisco’s remote HD video collaboration technology.

“As a company, we learned that if you ask, you can reach a worldwide audience of smart, passionate people eager to help you drive innovation”, said Guido Jouret (2009), the chief technology officer of Cisco’s Emerging Technologies Group, responsible for incubating Cisco’s future billion-dollar businesses.

The innovative management structure, with its empowering groups and a disciplined process increase the speed and efficiency of Cisco to move across into market adjacencies (McKinseyQuarterly, 2009).

The next step of the company is to continue to develop its capability to become the strategic orchestrator of different Networked Virtual Organizations (NVOs) that partner to bring products and services to the customer operate in a networked virtual ecosystem (NVE), for example as for its router business (see Fig. 17).

Figure 17. Networked Virtual Ecosystem as groups of Networked Virtual Organizations



Source : IBSG, 2003

5.2 Nokia Corporation

Company overview

Founded in 1865 as a paper mill, Nokia started producing phones in 1982. The company had interests in several businesses including telecommunications, consumer electronics, rubber, and cable. In 1992, Nokia took a strategic decision to focus only on the telecommunications business and to close down its other businesses. Today Nokia is a leading provider of basic and high mobile devices, mobile content services, and telecom network equipments and related services through a joint venture with Siemens, Nokia Siemens Networks. Its other major subsidiaries include NAVTEQ and Symbian. NAVTEQ is a leading provider of digital map information and related location-based content and services for automotive navigation systems, mobile navigation devices, Internet-based mapping applications, and government and business solutions. Symbian is the developer and licensor of Symbian open source operating system for mobile devices.

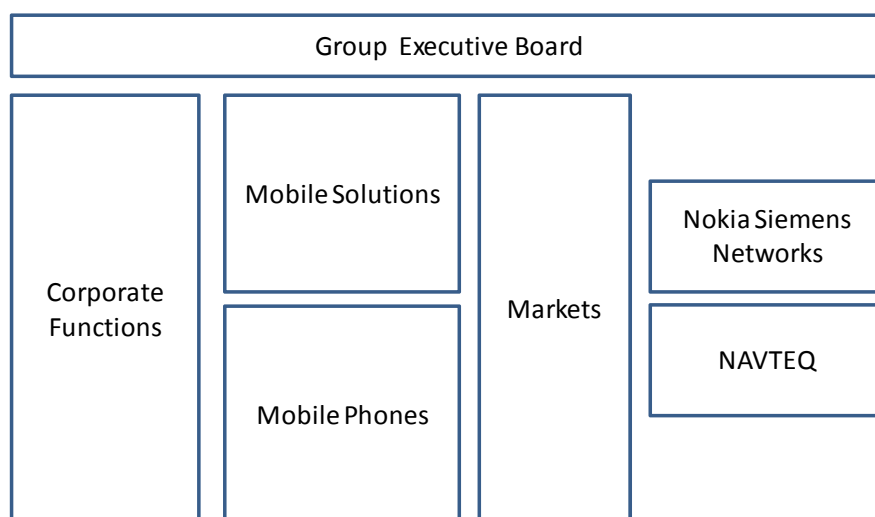
The company primarily operates in Asia and Europe. It is headquartered in Finland and employs about 123,600 people (FY2009). The company recorded revenues of €40,984 million (\$57,157.5 million) during the financial year ended December 2009 (FY2009), a decrease of 19.2% over FY2008. The operating profit of the company was €1,197 million (\$1,669.4 million) in FY2009, a decrease of 75.9% over FY2008. Its net profit was €891 million (\$1,242.6 million) in FY2009, a decrease of 77.7% over FY2008 (Datamonitor, 2010).

Nokia Research Center and its Open Innovation approach

Nokia invested 14.4% of its net sales in R&D in 2009 (€5,909 billion) employing 17,196 people. Its short and mid-term oriented goal aims to support the product development units to master key technologies and their evolution. The long-term horizon is oriented to develop disruptive innovation encouraging to bring forth ideas for new business development. Nokia has several integrated mechanisms and organizations for encouraging

and searching for innovation: Nokia Research Center, Nokia Venture Organization, Nokia Innovent and Nokia Growth Partners.

Figure 18. Nokia's organizational structure³¹



Source: <http://www.nokia.com/about-nokia/company/structure>

The external environment in the last years required a faster product innovation process and a more flexible and efficient supply chain. Nokia needed to better understanding its core capabilities, the capabilities of its suppliers and the needs of its end customers. As mentioned in previous chapters, M&As and strategic alliances are the means companies may adopt to obtain externally available capabilities they need (Barney, 1997; Wernerfelt, 1984). Nokia developed by a number of mergers and acquisitions (M&As) of other firms with related business activities, but it is now divesting and refocusing its

³¹ *Mobile Solutions* develops and manages smartphones, mobile computers and a world-class suite of internet services under the Ovi brand. *Mobile Phones* develops and manages affordable mobile phones and services. *Markets* manages Nokia's supply chains, sales channels, brand and marketing activities. *Nokia Siemens Networks*, jointly owned by Nokia and Siemens, provides wireless and fixed network infrastructure, communications and networks service platforms, as well as professional services to operators and service providers.

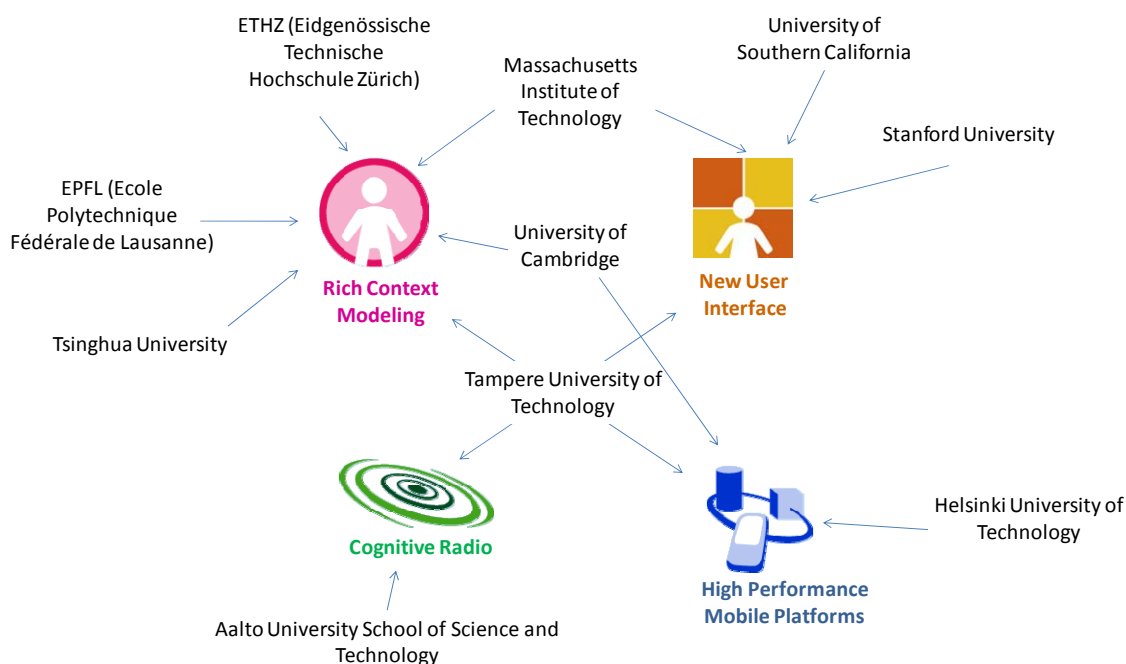
business activities. Although M&As are still important, Nokia is gradually shifting its focus from M&As, to strategic alliances in order to strengthen its core capabilities³².

Nokia Research Center was founded in 1986 from the Nokia Electronics R&D unit, with the headcount of 86 persons. Today, NRC is a part of Nokia Corporate Development, employs roughly 800 researchers from 43 countries and a wide variety of fields. Representing just over 4% of Nokia's R&D employees, NRC researchers produce about one half of Nokia's essential patents, and 34% of all Nokia invention reports. NRC has 13 locations worldwide, taking advantage of a wide variety of cultures, environments and skill-sets across the diverse geographies. Iannucci, SVP and head of Nokia's Research Center, announced that the research center is undergoing a transformation and is now organized internally into two equal parts: one focusing on making existing core mobile technology more efficient and the other, its Systems Research Center, which is looking at entirely new opportunities for the future and is allocated 50% of the research budget. The research conducted at Nokia Research Center today focuses on four main areas: Sensing and Data Intelligence, New User Interface, High Performance Mobile Platform and Cognitive Radio. Together, they explore the experiences people will have in the future, the technology and interfaces they will use, and the infrastructure required to make it happen³³.

³² For example, the dramatic rise of Nokia in wireless communications has been due, in part, to the strong lead it took in establishing the global system for mobile communication (GSM) technology as a standard for cellular phones. Accomplishing that required working closely with a number of other companies, as well as the governments of many European countries. Specifically, Nokia research helped define the now-accepted standards for moving GSM from a narrow- to broad-bandwidth spectrum and the company pushed hard to establish that technology: it willingly licensed the research to others and partnered with companies (including competitors) to develop the chipsets necessary for implementing the standard. Those efforts have helped Nokia to become the world's dominant supplier of wireless-phone handsets, controlling nearly 40% of the global market. Chesbrough, H.W., 2003. The era of open innovation. MIT Sloan Management Review, (Spring), pp. 35-41.

³³ For further information see http://research.nokia.com/about_nrc [accessed February 2011].

Figure 19. Nokia Research collaborations in strategic focus areas



At this research stage, the strategic alliances aimed to collaborate with a network of academic partners and external research centers, by sharing resources, leveraging ideas and expertise to enhance innovation speed and efficiency (see Fig. 19).

For example, at the beginning of the development of UMTS technologies (the third generation of mobile telecommunications) between 1997 and 2002 Nokia had 48 strategic alliance agreements, of which 25 were joint development agreements, 16 co-production contracts, six joint ventures and one standardization consortium. Nokia had many joint R&D agreements on relatively new technological capabilities with weak ties (Granovetter 1973), i.e. with partners it did not collaborate before (Dittrich and Duysters, 2007).

Nokia has three corporate venturing organizations: *Nokia Ventures Organization*, founded in 1998 and based in Espoo, Finland, operates as a subsidiary of Nokia Corporation and offers seed finance for early stage business ideas to both internal and external ventures (supported also by experts from the Research Centre), *Nokia Growth Partners* that invests in mid-to late-stage mobile technology, communications, services and

media companies, managing direct investments and fund-of-fund investments in other venture capital players, primarily in the United States, Europe and Asia³⁴, and *Nokia Innovent* (founded in 2006), an entrepreneurial innovation unit in Nokia offering expertise, resources, and a collaborative environment for early-stage entrepreneurs working on concepts that facilitate connections between people.

An official “Open innovation” initiative started in 2005 and a new organizational role was created, the Director of Open Innovation and Academic Relations for the Nokia Research Centre (NRC). He is responsible for the strategic and operational aspects of the collaborative research activities performed by the NRC laboratories across the globe.

Nokia makes a rich use of the web 2.0 tools to source new ideas and talent, to enhance communication and information sharing across the company at any level. It uses for example, video blog, infopedia, internal wikis, other online channels, webcasts, virtual events. This implies that people skills has to adapt to this new reality, acquiring the adequate level of web 2.0 literacy. Just to mention some of the new ways of working at Nokia, company wikis post the progress of current projects and a “Beta Labs” website - whose claim is “Shaping the future together” - plays host to hundreds of thousands of testers who provide feedback on new and potential applications³⁵.

Internal collaborations in enhances through High Touch and High Tech initiatives. High Touch is composed by a series of Nokia Way Cafés that are a one-day workshop repeated around the world to share and stimulate new ideas from employees. High Tech comprises the Nokia Way Jam, an Internet based massive online discussion event about selected topics for 72 hours.

To encourage and stimulate the open and external collaboration, on the other side, the company created “Forum Nokia,” a portal available in English, Chinese and Japanese, giving outside developers access to resources to help them design, test, certify, market and sell their own applications, content, services or websites to mobile users via Nokia devices

³⁴ <http://investing.businessweek.com/research/stocks/private/snapshot.asp?privcapId=6492065> [Accessed February 2011].

³⁵ <http://betalabs.nokia.com/> [Accessed February 2011] .

and OVI Nokia³⁶, an internet platform for registered developers to co-create applications and mobile services. For Henry Tirri, Head of Nokia Research Center, open innovation “it’s more than bringing in new ideas through collaboration, it’s also a good way to keep renewing the skills of the Nokia researchers and to validate the quality and direction of Nokia’s research.” (JBC, 2009)

Table 16. Nokia Corporation collaborative innovation model

Company	Nokia
Characteristics of the company (keywords)	Leading provider of mobile devices, telecom equipments, and mobile content services, headquartered in Finland. Strong brand image, significant market position. Turnover (FY2009): \$ 57,16 billion. Employees: 123,600
Market / competition	Intense competition, rapidly changing technological environment
Starting situation	The external environment required a faster product innovation process and a more flexible and efficient supply chain. Need of better understanding the capabilities of its suppliers and the needs of its end customers
Initiative	Internal collaboration: High Touch (Nokia Way Cafés, 1 day workshops repeated around the world); High Tech (Nokia Way Jam, Internet based massive online discussion event about selected topics for 72 hours) Open and external collaboration: Forum Nokia, OVI Nokia (internet platform for registered developers to co-create)
When	SC reorganization (1996), Nokia Open Innovation (2005)
Strategic goal	Speed in new product and service development and speed and flexibility of production Accessing new geographical areas, from subcontracting in production to R&D partnerships "Our mission is to go from being a very inward looking lab to a much more open lab, where we're seeking innovation from broader partnerships. Our ring of collaborators has to grow." Bob Iannucci, SVP and head of Nokia's Research Center
Sponsorship	Bob Iannucci, SVP and head of Nokia's Research Center
Expected outcomes	Increased speed of time to market and of R&D processes, capability to easily and fast identify the right competence in the company to (co-)develop an idea

³⁶ OVI means “adore” in Finnish

Antecedents	<p>Nokia developed as a company by a number of mergers and acquisitions (M&As) of other firms with more or less related but different business activities</p> <p>Clear definition of company's core capabilities in three fields: mobile handsets, network technology and middleware</p>
New practices	<p>Clearly definition of core competencies and continuous evaluation of what is strategically a "core" or "context" competencies of the firm</p> <p>Standardization consortia with other companies in the same line of business</p> <p>Joint development agreements of commonly accepted (open) standards</p> <p>High touch / High tech initiatives, Nokia Way Jam</p> <p>Forum Nokia, OVI Nokia platform and Nokia Beta Labs - Shaping the future together</p> <p>Web 2.0 tools to enhance communication and information sharing across the company at any level (video blog, infopedia, other online channels, webcasts, virtual events)</p> <p>Alliances on new technological capabilities (exploration phase)</p> <p>Spinning-in technologies from competitors and suppliers</p>
External source of innovation	Any external source of ideas (technical experts, developers, designers, content creators), universities, industry partners and competitors
External idea selection criteria	<p>Technical solutions and content</p> <p>Nokia Venturing Organization is focused on corporate venturing activities that include identifying and developing new businesses, or as they put it "the renewal of Nokia"</p> <p>Nokia Venture Partners invests exclusively in mobile and I/P related start-up businesses</p> <p>"Innovent"(2006), directly supports and nurtures nascent innovators with the hope of growing future opportunities for Nokia</p>
Cultural change	<p>Relationship based on trust and information sharing, rather than a formal contract.</p> <p>Nokia beta labs shaping the future together</p> <p>Beyond "not invented here" and are embracing "let's find the best ideas where ever they are"</p>
Organizational change and actions implemented	<p>Ad hoc profile: Director of Open Innovation and Academic Relations Nokia Research Center</p> <p>Network of labs around the world to create an Open Innovation network</p> <p>Nokia Venturing Organization to identify and develop new businesses, or "the renewal of Nokia"</p> <p>Nokia Venture Partners to invest exclusively in mobile and I/P related start-up businesses</p> <p>"Innovent", to directly support and nurture nascent innovators with the hope of growing future opportunities for Nokia</p>
New skills and capabilities	<p>Innovation passionate</p> <p>Technology users (web 2.0 tools)</p> <p>Collaborative and participating mindset</p>

ITC tools	Web 2.0 tools (wiki, blog, text, IM, and other communication tools) Open innovation newsletter Technology platforms Open standard platforms
Performance measurement system	# of ideas coming from external sources % of turnover generated through external sources Level of participation during virtual events or web 2.0 initiatives and after such events (registrants, logins, # of posts, % of active posters vs readers, average thread length)
Results	SyncML Initiative supported by hundreds of leading wireless companies. Symbian Foundation, the most widely distributed mobile operating system available on over 300 million handsets, today under transformation in a licensing entity with no permanent staff. Location Interoperability Forum (LIF), collaboration on the interoperability of Multimedia Messaging Services
Today's new strategic goals	Open innovation community growth (OVI Nokia and Forum Nokia)

The strategic goal of the Open innovation initiatives has been mainly focused on accelerating Nokia speed in new product and service development and increase its flexibility of production. As the senior vice president of Nokia's Research Center, Bob Iannucci, said *“Our mission is to go from being a very inward looking lab to a much more open lab, where we're seeking innovation from broader partnerships. Our ring of collaborators has to grow”* (Waring, 2006).

Although all these initiatives actually increased the Nokia knowledge accessing capabilities to potentially develop new services and new products, the return on the investments in such initiatives is still lying dormant.

Taking a look at financial statements and up to date press, actually, the company faced a change in the CEO direction due to the need of transforming this potentiality in innovation. The degree of R&D expenses in Nokia, indeed, seems to be disproportionately high compared to the R&D expenses of their competitors, at least in the mobile phone industry (Apple *in primis*, for example) and the innovation rate that this R&D expense produce (Reuters, 2010).

In this direction the next step of Nokia innovation strategy will aim to increase the capability to collaborate in order to introduce new products, not only to potentially explore

new technologies or market opportunities. The imperative is now effectively launching new solutions in order to face a fierce competition, exploiting the potentiality of its open innovation community (OVI Nokia and Forum Nokia). The new CEO, Stephen Elop, noticed that even though Nokia has some brilliant sources of innovation inside, it is not bringing it to market fast enough. The new challenge is to create an ecosystem of innovation *“where ecosystems include not only the hardware and software of the device, but developers, applications, ecommerce, advertising, search, social applications, location-based services, unified communications and many other things. Our competitors aren't taking our market share with devices; they are taking our market share with an entire ecosystem. This means we're going to have to decide how we either build, catalyze or join an ecosystem.”* (Toi, 2011)

5.3 Nestlé SA

Company overview

Nestlé was established in 1866, by a pharmacist, Henri Nestlé, as a producer of food for babies who were unable to be breastfed. Today is the largest food and beverage company in the world by sales. The group's products include beverages, milk based products, ice creams, prepared dishes that generates 95% of its sales, and pharmaceuticals and cosmetics products. Nestlé primarily operates in Europe, the Americas, Asia, Oceania and Africa. The group is headquartered in Vevey, Switzerland and employs 283,000 people. Nestle has a strong brand portfolio. Its key brands, associated with quality and are global leaders in their respective markets, include Nestle, Nespresso, Maggi, Buitoni, Stouffer's, Dreyer's, KitKat, Purina and Friskies among others.

The company recorded revenues of CHF107,618 million (\$99,398.1 million) during the financial year ended December 2009 (FY2009), a decrease of 2.1% as compared to FY2008. The decrease in revenues was primarily attributed to the fact that the company trades a wide range of currencies and the weakness in these currencies against the Swiss Franc negatively impacted sales by 5.5%, divestitures by 0.8% and acquisitions by 0.1%. The operating profit of the company was CHF15,699 million (\$14,499.9 million) in FY2009, an increase of 0.1% over FY2008. The net profit was CHF10,428 million (\$9,631.5 million) in FY2009, a decrease of 42.2% as compared to FY2008 (Datamonitor, 2010).

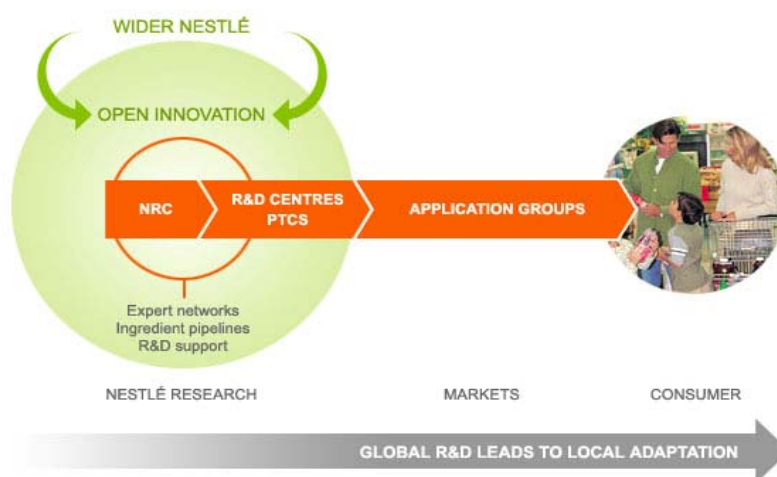
Nestle is also efficiently utilizing its R&D capabilities to position itself in the health and wellness market. Nestlé's recent strategy is to strengthen its position as a nutrition and well-being company, as consumers are increasingly become health conscious.

Opening up the innovation in Nestlé: the Innovation Partnership program

Nestlé's history reveals 140 years of success and nearly all of its flourishing innovations came from the inside. Nestle has strong research and development (R&D)

capabilities. The company invests CHF2,000 million (\$1,847.2 million) in R&D annually. Around 5,200 people work in 24 R&D centers and over 250 application groups in food and beverage development and product testing centers.

Figure 20. Nestlé Research Structure



Source: <http://www.nestle.com/NestleResearch/GlobalRnD/GlobalRnD.htm>, accessed November 2010

Today's changing environment and advancement in science required an increase in innovation frequency³⁷. For the food industry, and especially for the consumer goods industry, innovation is a combination of a product's inherent value to the consumer, combined with elements of services and solutions, well-being, good & healthy-for-me, and convenience (Traitler and Saguy, 2009). Nestle expects to get half of its growth revenue as a result of its innovation program. To achieve its growth objectives Nestlé embraced new business model combining internal its R&D strength and extending its reach by tapping

³⁷ Peter Brabeck-Letmathe, Nestlé's CEO: "The constant improvement of existing products is just as important as the invention of new once. Innovation and renovation go hand in hand" (Rouach D., Rouach O. M., 1997)

into the technologies and expertise of more than a million researchers around the world (Kaplan, 2009).

The company's research and development activities are structured in three core functions: the *Nestlé Research Center* (NRC) that provides the base for R&D innovation across all Nestlé business sectors; the *Business Technology Centers* (BTC) which develop and enhance Nestlé's business systems to improve the efficiency of Nestlé's operations and *Product Technology Centers* (PTCs) which are aligned with particular Nestlé businesses to provide expertise for specific product categories, and - together - forming a hub for global product and process development; the *Research and Development Centers* (R&D Centers) who work in close collaboration with the Product Technology Centers to meet regional R&D requirements and provide input to localize products depending on consumer preferences; and, lastly, the Application Groups (AGs) based in Nestlé factories which are responsible of the R&D process at the local level, ensuring that products comply with local regulations and taste preferences. To accelerate its research and development process, at the end of 2006 Nestlé Research adopted its model of open innovation that includes innovation partnerships, alliances and contract research. Nestlé's approach to Open Innovation is a combination of internal resources with external assets. In fact, Nestlé recognized that universities, academia, small start-ups, biotech companies and large industrial suppliers were very important potential sources of innovation. "*By finding, adapting and deploying appropriate outside innovation, we can substantially accelerate our Innovation / Renovation Pipeline*", said Helmut Traitler, Vice president of Innovation Partnerships, a new organizational role created to underline the strategic importance of pursuing ideas from outside the company³⁸.

³⁸ Dr. Helmut Traitler has a PhD in Organic Chemistry from the University of Vienna, Austria. In 1981 he joined Nestlé Research in various functions and became a member of the Editorial Board of JAOCS (J. Of Am. Oil Chemistry Society). In 1993 he created the Nestlé Technology Transfer Team in Lausanne, Switzerland and later became Head of the department of Food Science & Technology. Different assignments such as Head of the Nestlé global confectionery R&D in York, UK, and as Director of Corporate Packaging in Glendale, CA, followed. In 2003 he became Head of Nestlé global packaging, Nestlé Ltd., in Vevey, Switzerland. Between October 2006 and end of April 2010, Helmut Traitler was the VP of Innovation

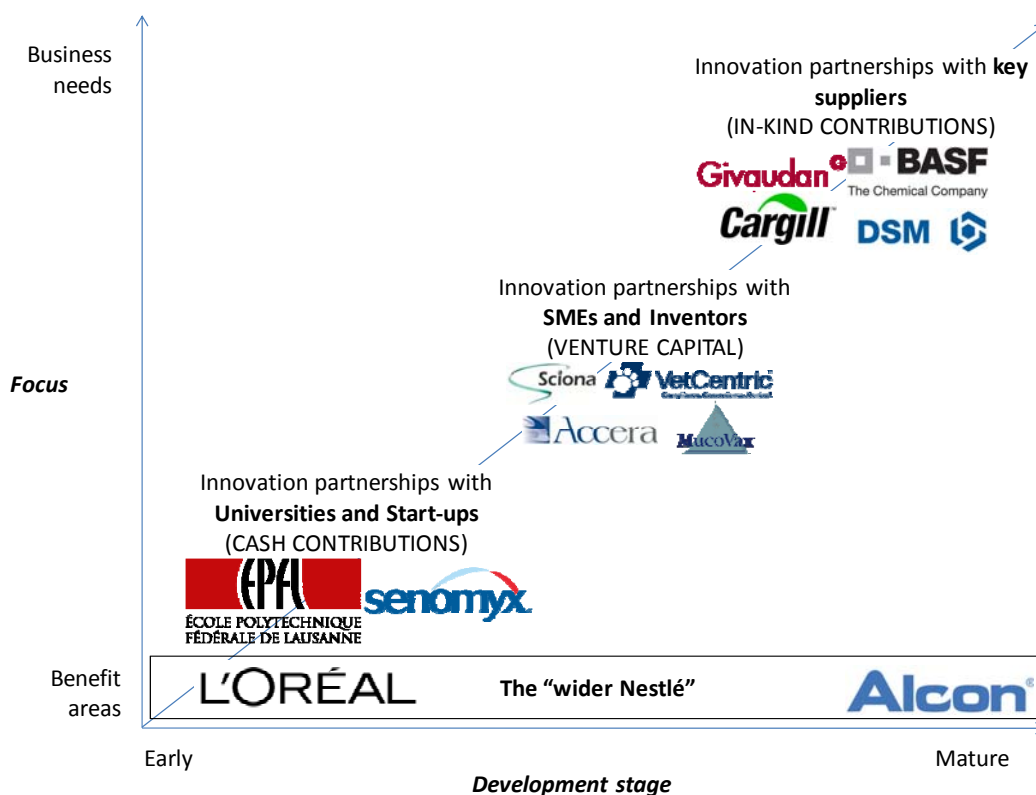
Nestlé established three types of worldwide collaborations: simple contract work carrying out clinical trials or analytical work; several collaborations with universities, research institutes, and medical centers, and a select number of special strategic Innovation Partnerships (INP).

The Innovation Partnership program indeed expands the Open Innovation definition in a new way to collaborate in all areas of discovery and development with external partners who can bring competence, commitment, and speed to the relationship (Traitler, 2009). Consequently, the Innovation Partnerships allowed Nestlé to select specific providers to complement internal knowledge and accelerate the innovation process.

In particular, different subjects are involved along the different stages of the innovation process. Universities are predominantly connected during the early and mid stage of the innovation process in order to search for new ideas, start-up companies and inventors are predominantly involved in mid and early stage to develop new ideas, and, at last, large key industrial partners collaborate mainly in mature developments during the implementation phase of new products or services (see Fig. 21), venturing or partnering when a business case already exists.

Partnerships at Nestlé Ltd., working from Glendale, California as well as Vevey. Since August 2010 he works for his own company “Life2Years, Inc.”

Figure 21. Typical development stages of innovation partnerships

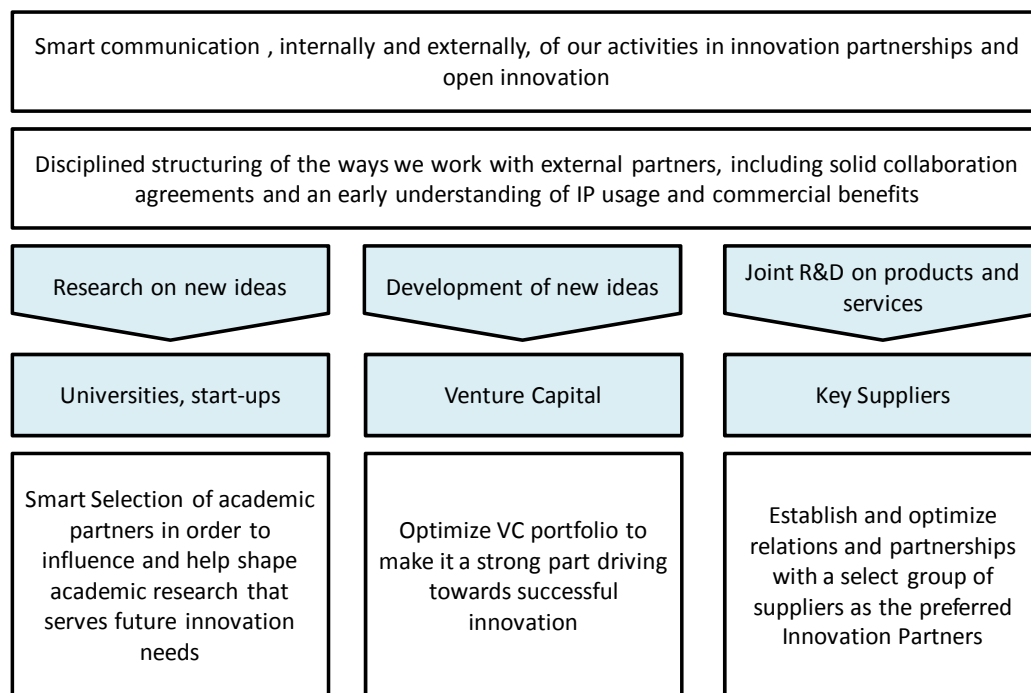


Source: Adapted from Monitor Group, 2008

Described in a supply chain perspective, collaborative innovation may involve upstream and downstream partners. Upstream partners may collaborate in all stages of innovation (early, mid and mature). As mentioned before they typically come from universities, start-up companies, and inventors, but may also be large industrial partners (i.e., ingredient and packaging suppliers). For its upstream partnerships only, Nestlé has compiled its future needs and requirements for all its businesses and individual business units and shares this information with its innovation partners.

Downstream partnerships occur with a select group of large customers (i.e., retailers), in order to identify innovation ideas based on shoppers' insights.

Figure 22. Innovation partnerships (INP) and Open Innovation (OI) model in Nestlé



Source: Ballevre O., 2010

External innovation ideas, scientific knowledge, technologies are captured through several ways: first of all the internal contact network of Innovation Partnerships Champions in the Nestlé R&D and Business Units; Nestlé's suppliers, innovation partners, and their networks; some focused and dedicated external resources (e.g. Swissnex³⁹); specialized internet search engines and industry organizations (e.g. Corporate Executive Board⁴⁰); university partnerships; venture capital investments selected, highly connected, highly experienced and extremely motivated Nestlé retiree network. With its Adopt-a-University

³⁹ Swissnex is Switzerland's Knowledge Network, a network of science and technology outposts run by the Swiss State Secretariat for Education and Research (SER), in close cooperation with the Federal Department of Foreign Affairs (FDFA). For example, in 2007, Nestlé's Innovation Partnership Group opened an Innovation Desk at Swissnex San Francisco. They mandated swissnex San Francisco to identify strategic partnerships that innovate nutrition, health, and wellness. For more information see <http://www.swissnex.org/> [accessed December 2010]

⁴⁰ See <http://www.executiveboard.com/about/index.html> for details [accessed February 2011]

program Nestlé aims to improve the visibility of Nestlé Research at partner Universities and become the preferred partner for sourcing and recruiting high potential candidates through collaboration and dedicated projects.

“Sharing is winning” strategy

An important internal culture change is based on the Nestlé philosophy of “sharing is winning”⁴¹, which means sharing well-defined elements of information with the potential innovation partners, sharing the know-how and resources within a specific framework of confidentiality and define clear expectations from the potential collaboration such as resulting solutions, their timing, related costs and benefits as well as IP ownership.

The antecedents to an internal culture of collaboration and sharing can be traced in the creation of Nestec S.A.⁴² (1969) as a knowledge management system, an internal consulting company which operates at all levels of Nestlé’s value chain, owned 100% by Nestlé SA in Vevey Switzerland (Rouach and Rouach, 1997; Mas, 1997) and Nestlé Technology Transfer Team, created in Lausanne, Switzerland (1993) by Traitler.

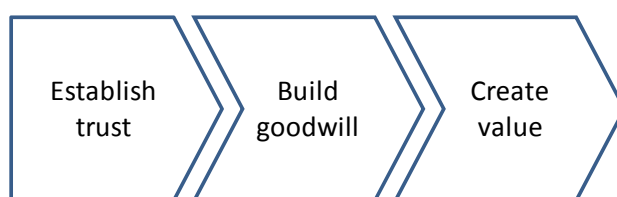
Searching outside the company boundaries, interesting growth opportunities can be co-created with partners if the relationship is based on a strong foundation of trust and goodwill (Traitler, 2009; Kaplan, 2009). Operatively, Nestlé initially adopts general agreements (e.g., confidentiality and protective agreements) that spell out under which terms strategic and confidential information could be shared. Furthermore, to simplify the first phases of a potential collaboration and thus speed up the process, Nestlé has established Master Joint Development Agreements (MJDAs).

⁴¹ Some of Nestlé’s key partners who have been participating in its “Sharing Is Winning” strategy include Barry Callebaut, BASF, Cargill, Cognis, DSM, DuPont, Firmenich, Fonterra, Givaudan, IFF, Kerry, Mane, Symrise, and Tetra Pak, to name only a few.

⁴² Nestec’s subsidiaries are Nestlé Research Center (50%) based in Vers-chez-les-Blanc (Lausanne), the training center Rive-Reine-Nestec Ltd. and 18 research centers throughout the world (http://www.lexpansion.com/economie/nestec-la-machine-a-nestleiser-de-nestle_6674.html) [accessed December 2010].

In principle, a typical MJDA comprises two parts: (1) terms of confidentiality between the two parties as well as possible affiliates of each partner (it may also contain a definition of the potential ownership of the jointly created innovation solutions), and, 2) a detailed description of a project resulting from one or more joint ideation meetings or discussions between the partners.

Figure 23. Relationship stages of Innovation Partnerships in Nestlé



Source. Traitler, 2009

Typically, the main body of a MJDA details the project, expectations, resources, timelines, intellectual property, and all other elements necessary for best practices. Once MJDA has been established, it allows partners to enter into the next phase, defined as “discover the opportunities”, saving unnecessary, unproductive discussions and relationship-damaging conflicts.

In its open innovation model, Nestlé clearly defines and externally communicates its areas of interest, future needs and requirements for all its businesses and individual business units. If an external individual inventor or a potential partnering company is interested to collaborate with Nestlé, a Technology Submission Agreement has to be preventively signed declaring that the information shared are on a non-confidential basis (see <http://www.research.nestle.com/OpenInnovations/TechnologySubmission/> for details).

This new organizational culture based on the principle of “sharing is winning” requires to managers involved in the innovation process a leadership vision, the capability of roadmap planning considering external technology exploitation and partnerships and an individual capability to naturally and routinely develop network and seek external potential solution providers.

Table 17. Nestlé SA collaborative innovation model

Company	Nestlé SA
Characteristics of the company (keywords)	Largest food and beverage company in the world, with a strong and trusted brand, leader in its industry. High investment in R&D, strong patent portfolio and ability to customize products to the local market conditions. Turnover (FY2009): \$ 99.4 bio. Employees: 283,000
Market / competition	Extremely competitive, mature and global market
Starting situation	Long history of the company (140 years of success) and nearly all of its flourishing innovations came from the inside. High competition and more complex products (nutraceuticals) requires a higher rate on innovation
Initiative	Open innovation and Innovation Partnerships, 2006
When	2006
Strategic goal	To become the No. 1 consumer goods company for Nutrition, Health, & Wellness and accelerate the research and development processes
Sponsorship	Helmut Traitler, Nestlé's Head of innovation partnerships (new role created ad hoc)
Expected outcomes	Increased speed of time to market and of R&D processes
Antecedents	Nestec SA (1969), in Vevey, Switzerland Nestlé Technology Transfer Team (1993) in Lausanne, Switzerland (created by Traitler) Nestlé Research collaboration with other Nestlé organizations (Nestlé Nutrition Council, Nestlé Nutrition Institute, Nestlé Nutrition Foundation)
New practices	Future needs and requirements collection (for all its businesses and individual business units) General confidentiality agreements Master joint development agreements (MJDAs) Definition and specification of crystal-clear goals, resources, timelines, and milestones as well as assigning of intellectual property and value-sharing solutions. Technology Submission Agreement
External source of innovation	Science universities, academia, small start-ups, biotech companies and large industrial strategic suppliers, government laboratories
External idea selection criteria	Areas of Research Interest for Nestlé Clear definition of objectives comparing to the stage of innovation processes. Venturing or partnering when a business case already exists.
Cultural change	From "not invented here" to "sharing is winning" From "innovate or die" to "partner or perish"

Organizational change and actions implemented	Helmut Traitler, Nestlé's vice president of innovation partnerships (new role created ad hoc) Corporate Venture Program Innovation Partnership
New skills and capabilities	Leadership vision, capability of roadmap planning considering external technology exploitation and partnerships. Capability to naturally and routinely develop network and seek external potential solution providers.
ITC tools	Dedicated website for OI (http://www.research.nestle.com/OpenInnovations/) with clear guidelines for technology submissions
Performance measurement system	Effectiveness and speed are the operative and overriding principles of any innovation partnership.
Results	In 2008, Open Innovation created \$200 million in new business for Nestle Reduction of time to market (from 36 to 18 months) and risk to Nestle, since development costs come after an idea is proven.
Today's new strategic goals	Through its Corporate Venture Program, Nestlé plan to invest CHF 1.5 billion over the next 10 years in start-up and growth-phase food, nutrition, health and wellness companies.

In 2008, Open Innovation created \$200 million in new business for Nestle, about 10% of its overall growth from what he calls innovation/renovation. The average time to market has been reduced from 36 to 18 months and the risk physiologically linked to innovation projects has been reduced to Nestle, since development costs come after a (specifically external) idea is proven.

Over the next 10 years Nestlé plan to invest CHF 1.5 billion in start-up and growth-phase food, nutrition, health and wellness companies, through its Corporate Venture Program (Traitler, 2009).

6. Evidences from the case studies and results

The case studies conducted highlighted some common aspects concerning the need of combining internal and external sources of innovation in order to successfully compete in turbulent competitive environments. The deep analysis of the data gathered helped to define an extended version of the theoretical framework proposed by Defee and Fugate (2010, see chapter 2.3) that will consider how the variables will change if the model is applied to the innovation process, especially combining internal and external sources in order to successfully compete in turbulent competitive environments. Companies can manage such complexity, starting from a new strategic vision (sponsored by the CEO and top management), creating or adapting new organizational processes and requiring different attitudes and skills from its employees and collaborators.

A synoptic table is reported below in order to synthesize the evidences emerged from the cases (see table 18).

Table 18. Case studies and company characteristics

Company	P&G	Nestlé SA	Cisco Systems, Inc.	Nokia
Industry	Consumer goods	Food and beverage	ICT	ICT, consumer electronics, cable
Characteristics of the company	FY 2010 Turnover: \$78.9 bn Employees: 127,000	FY 2009 Turnover:\$99.4 bn Employees: 283,000	FY 2010 Turnover \$40.0 bn Employees: 65,550	FY 2009 Turnover: \$57,2 bn Employees: 123,600
Starting situation	Need for new sources of innovation.	Need for a higher rate on innovation	Need to make faster decisions and increase the rate of innovation	Need for a faster product innovation process
Initiative	Organization 2005 (1999); Connect and Develop (2001)	Open innovation and Innovation Partnerships (2006)	Collaborative organizational structure of councils, boards and working groups (2001) I-Prize for collaborative	Internal collaboration: High Touch; High Tech Open and external collaboration: Forum Nokia, OVI Nokia

innovation (2007)				
Strategic goal	50% of innovation coming from external sources	Accelerate the research and development processes	Identify new business opportunities and improve the rate of successful innovation	Accessing new geographical areas, from subcontracting in production to R&D partnerships.
Sponsorship	CEO and key top innovation managers	CEO and Head of innovation partnerships	CEO	CEO and SVP and head of Nokia's Research Center
New culture	From "not invented here" to "proudly found elsewhere"	From "not invented here" to "sharing is winning" From "innovate or die" to "partner or perish"	"We want a culture where it is unacceptable not to share what you know."	From "not invented here" to "let's find the best ideas where ever they are"
Expected outcomes	Improving the rate of profitable innovations leveraging from external sources and partners.	Increased speed of time to market and of R&D processes	Decreased time for decision taking (for collaborations, acquisition or new products/service business cases evaluation)	Increased speed of time to market and of R&D processes, capability to easily and fast identify the right competence in the company to co-develop an idea

In the following paragraphs evidences and results will be presented, related to each research question.

6.1 Proposal for a new network dynamic innovation capabilities' framework

The first research question of the study was directed to analyze

RQ1. What are the determinants of a framework for network dynamic innovation capabilities?

The four cases studied (including the pilot case) helped to define the proposal for a new network dynamic innovation capabilities' framework, starting from the model presented by Defee and Fugate (2010, see chapter 2.3). The final goal of the proposed model is to create sustainable competitive advantage through the creation of innovation dynamic capabilities into a network of players.

Sustainable competitive advantage is the result of the continuous establishment of temporary competitive advantages as explained in the Supply Chain Dynamic Capabilities model (see chapter 2.3). With particular reference to the innovation networks, dynamic capabilities requires different strategic orientations. Prerequisites for the development of network innovation dynamic capabilities are a higher degree of openness towards external sources of innovation, to be combined with the internal existing capabilities.

The case studies actually demonstrate that a open-minded approached, supported by the CEO and the top management (i.e. stated in a clear strategic intention), helps companies to implement a systematic scouting of external opportunities, both in the idea generation phase and in the development and launch phases.

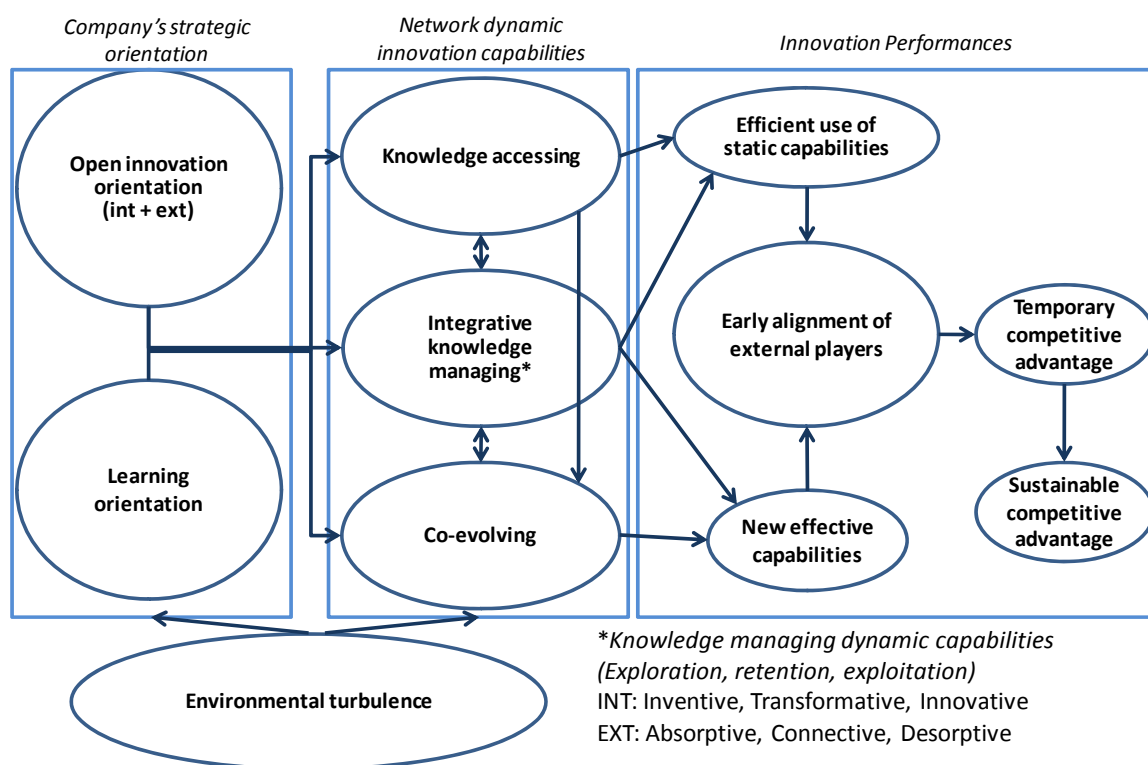
The cases show that a combination of internal and external development allows companies to increases their innovation dynamic capabilities.

External contributions can be intended both outside the boundaries of the company or outside a specific division. The cases analyzed, indeed, highlighted the importance of creating an internal network of communication and experience exchange among the different business units, or company labs, dispersed all around the world. Only after a full

knowledge on how to collaborate in the “internal network”, companies are ready to expand this collaborative practice with other external companies.

The determinants of the model refer to the strategic and cultural orientation of the organization to look beyond its boundaries, in the internal network or external players. This can be defined “*Open innovation orientation*” (Rie and Hoppe, 2001; Chesbrough 2003; Chesbrough and Crowther 2006, Enkel, Gassmann, Chesbrough, 2009) as described in the cases.

Figure 24. A proposal for a new network dynamic innovation capabilities’ framework



For example, in Nestlé this cultural change is interpreted in a “*sharing is winning*” or “*partner or perish*” strategy that involves external players, implemented through its *Open Innovation* initiatives or *Innovation Partnerships* program. P&G structured its external networks in two ways: its internal network connecting the different P&G labs, individual researchers and business unit’s research centers around the world, and connecting with potential external sources of innovators through a network of

intermediaries (“innomediares”) that scout interesting business opportunity for P&G and create the connection with the company. The organizational culture overpassed the “*not invented here*” syndrome to adopt a wider “*proudly found elsewhere*” motto. Nokia added to the internal initiatives to foster the collaboration among their employee, open and external collaboration programs in order to scout and involve any source of innovation from outside the company (Forum Nokia, Nokia OVI for developers). Lastly, Cisco implemented an Open Innovation Orientation both internally with its reorganization in Councils, Boards, Committees and collaborative teams and externally through its “*Global community*”, “*Human Network*” and “*I-Prize*” initiatives or its *NVOs* structures to identity new interesting business opportunities to develop (internally, acquiring the inventor company, or externally, helping, supporting, and partnering with external companies to successfully develop and launch the new services or products).

The open innovation orientation is not enough to create a sustainable advantage but needs to be combined with a *Learning Orientation* (Cohen and Levinthal, 1990, Lane et al., 2006). In the analyzed cases, a Learning Orientation is associated with the necessity of a collaborative mindset and behavior (“a culture where is unacceptable not to share what you know”, as said for Cisco), a capability to naturally and routinely develop networks (at a corporate level and at an individual level as required in Nestlé), a strong capability to be comfortable with collaboration (P&G).

These two company’s strategic orientations (*Learning Orientation* and *Open Innovation Orientation*) are the entry requirements a firm needs to be able to develop its *network dynamic innovation capabilities*.

Firms face the creation of a systematic openness to reconfiguring the knowledge capacities in order to shape and adapt to their environment (Zahra et al., 2006) and gain a temporary competitive advantage that, continuously maintained, allowed them to better perform in the competitive arena with a sustainable competitive advantage.

The dynamic capabilities that companies should develop refer to: the knowledge accessing capability, the integrative knowledge managing capability and the co-evolving capability.

As mentioned in the previous chapters, the *knowledge accessing capability* (Cassiman and Veugelers, 2006; Grant and Baden-Fuller, 2004; Gulati, 1999) is the capability to easily scout and access to existing technologies, ideas, sources of innovation, distribution channels, markets that do not belong to the company but can be exploited and leveraged with partnering initiatives. A high level of knowledge accessing capability allows the company to efficiently reach its business targets without incorporating and internally develop what it already exists and can be used in its external network. An efficient use of the “static capabilities” of the network will bring a temporary competitive advantage through the early involvement of the external partner into the innovation process of the company promoting the innovation.

As demonstrated in the P&G pilot case, the knowledge accessing capability has been developed through the internal and external networks, using also external technology brokers to quickly identify solution providers coming from the outside. The Nokia Forum or OVI platforms are the tools that encourage external contributions to collaborate in developing new services and products with Nokia, along with its strong partnership with Academic labs around the world. Cisco Alliances program and NVOs structures try to identify external potential partners with whom collaborate in a win-win way, combining existing complementary competencies or accessing external ideas (that are usually internally further developed) thanks to its I-Prize initiative. Nestlé, finally, with its Corporate Venture Program and Innovation Partnership try to detect attractive potential new business ideas from external (already existing) sources.

A proposal for a new framework that extend the considerations already reported in the supply chain context (see chapter 2.3) is then formulated with its own research proposition to be tested in future researches.

RP1. The impact of an *Open Innovation* orientation and a *Learning Organization* on the level of network dynamic innovation capabilities (knowledge accessing, integrative knowledge managing and co-evolving) is greater in more turbulent environments.

All the cases have longitudinally demonstrated that the need to stress the external collaborations and the re-definition of the internal culture (towards a learning organization) to reconfigure what is core, context, non core emerges in turbulent competitive environments.

RP2. The more *Open Innovation* orientation companies possess, the more *knowledge accessing* will occur between potential partners.

RP3. The more *Learning Organization* companies possess, the more *knowledge accessing* will occur between the partners.

The cases suggests that there is a positive relationship between the degree of openness of an organization and its capability to access to external sources of knowledge.

The openness is both intended as willingness to explore outside its own boundaries (internal and external collaboration) (**RP2**) and the predisposition to learn from new stimuli (**RP3**).

When the external sources requires an adaptation and evolution of the internal knowledge, the learning orientation nature of a company brings it to *co-evolve* (Helfat and Peteraf 2003; Koschatzky, 2001) towards the development of *new effective capabilities*, at a lower effort than acting all by itself.

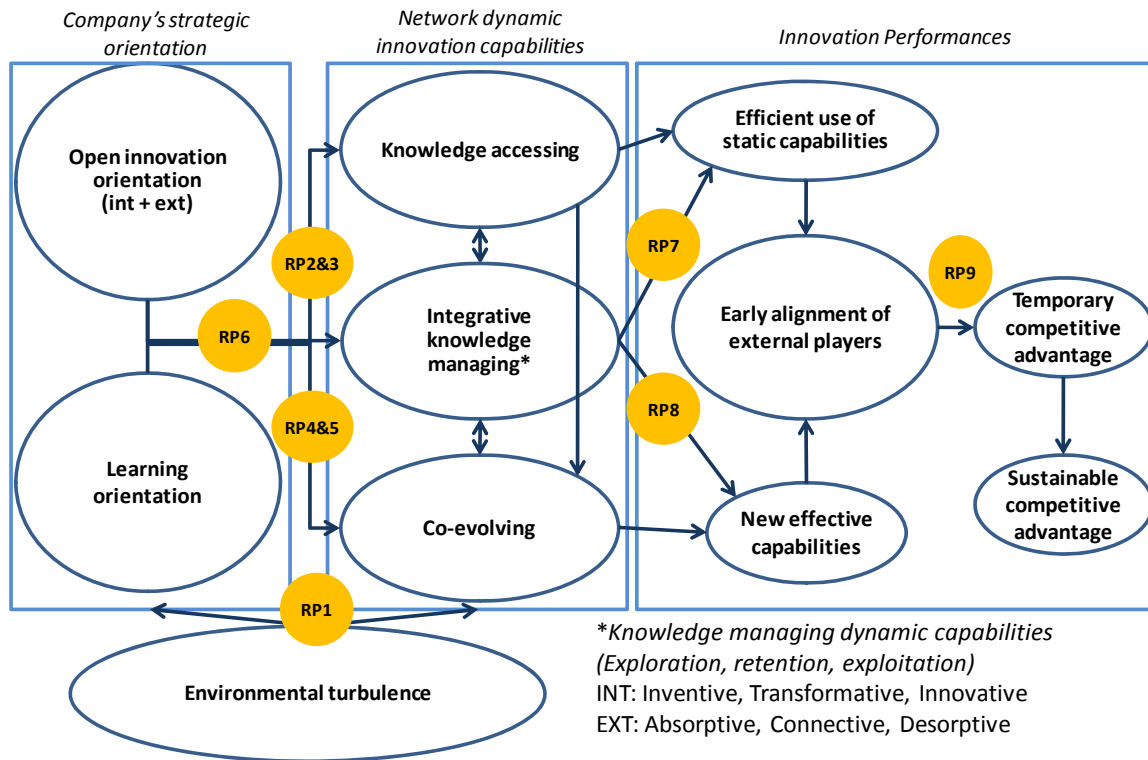
In this case, the capability to absorb, integrate, transform and combine external knowledge (market knowledge, customers' insights or technology and technical knowledge) is fundamental in order to create the competitive advantage of the system of collaborators (the network of the collaborating partners) against other network organizations.

RP4. The more *Open Innovation* orientation companies possess, the more *co-evolving* will occur between the partners.

RP5. The more *Learning Organization* companies possess, the more *co-evolving* will occur between the partners.

The relationships in the model between the knowledge accessing capability and the efficient use of existing resources is the same of the one proposed by Defee and Fugate (2010): the higher the level of knowledge-accessing innovation partners possess, the greater efficiency existing static capabilities will achieve.

Figure 25. A proposal for a new network dynamic innovation capabilities' framework and its research propositions



A similar relationship occurs between the co-evolving capability and the creation of new effective capabilities: therefore, the higher the level of co-evolving innovation partners possess, the more new effective capabilities will be continuously created.

This two capabilities (*accessing* and *co-evolving*) are linked to each other: in particular, the higher the level of knowledge accessing possessed by companies, the higher

the level of co-evolving the innovation partners will develop. Accessing key knowledge requires a high level of absorptive capacity. The generation of internal knowledge is then the prerequisite to the development of an integrative and absorbing capability (Cohen and Levinthal, 1990).

A third dynamic capability emerge as very important in reference to the innovation processes immersed in a networked environment: the *integrative knowledge managing capability* (Argote et al. 2003, Lane et al., 2006, Lichtenhaler and Lichtenhaler, 2009).

RP6. The more *Open Innovation* orientation and the more *Learning Organization* companies possess, the higher is the ability to dynamically integrate (and manage) knowledge (internal and external)

As explained in chapter 3.5 (see p. 53), the *integrative knowledge managing capabilities* allows a company to continuously refresh its portfolio of capabilities in order to be consistent with its competitive strategy and leveraging the external possibilities given by potential partners, external supplier or customers (if we consider to pure insource or outsource of a competence, technology, ideas, etc.).

For example, all the cases analyzed stressed the importance to continuously invest in internal R&D for a twofold objective: maintain the capability to absorb and integrate external knowledge and to be the “preferred partner” of a potential external player looking for collaborative projects. As the competition has moved from single companies against single companies to the competition among supply chain and networks, to be externally recognized as a good partner in collaborative projects becomes a winning distinguishing factor. Web 2.0 tools in this case help companies to create, maintain, diffuse and recombine the existing knowledge, internally (for example through the Community of Practices or Global Technology Councils in Nestlé, or internal wikis, blogs, knowledge management and IT document platforms in Nokia and Cisco), and also externally, when accessed from the outside under specific limitations. Examples are the interfaces created to invite potential inventors to collaborate with the companies, such as platforms, technology briefs, pre-general joint development agreements.

RP7. The more *integrative knowledge management* capability companies possess, the higher is their ability to *efficiently use existing static capabilities*.

RP8. The more *integrative knowledge management* capability companies possess, the higher is their ability to create, use and recombine *new effective capabilities* in the network.

An efficient use of existing and new capabilities, when combined with an early and clear involvement of each partner in the process, may bring to a higher level of temporary competitive advantage.

The early supplier involvement in new product development has been deeply studied and theorized (Schiele, 2010; Wynstra, Von Corswant and Wetzels, 2010; Wynstra, Weggeman and Van Weele, 2003; Wynstra and Ten Pierick, 2000; Croom, 2001; Rigby, 1996). In an extended environment such as the one of the open innovation theory or the networked organizations, the clearly anticipation of common goals, procedures, contributes, risks, revenues of each partner (or external subject participating to the innovation process) will reduce the risk of increasing the time to market and the costs associated to the idea that the company intend to develop.

RP9. The more network players are *early aligned and involved in the process*, the more successful *temporary competitive advantages* will be realized.

The cases analyzed, in fact, highlighted the importance of having clear procedures to collaborate, clear pre-joint development agreements, clear contact point from both side of two organizations that intend to collaborate in order to minimize potential conflicts and to increase the perceived trust between the partners.

As for the Defee and Fugate's model (2010), the more *temporary competitive advantages* realized by innovation partners, the more *sustainable* will be their *competitive advantage*. The cases studied, indeed, are selected combining different most innovative

companies' rankings in order to guarantee that the strategic decisions analyzed have resulted into good innovation performances.

6.2 Critical success factors for implementing a collaborative innovation ecosystem

The research intended to investigate

RQ2: What capabilities do companies have to develop in order to enable the implementation of the framework?

At a corporate strategy and culture level, the CEO and top management sponsorships are a prerequisite of any organizational change, especially if related to the openness to the idea that external sources are as precious as internal.

A clear definition of the company's core competencies is the starting point of the creation of a clear and comprehensive roadmap planning considering both internal cores and external technology exploitation and partnerships. The whole organization has to embrace an open and collaborative mindset.

New organizational processes recognize and legitimize the importance of the new collaborative approach. From the organizational point of view reward systems should be based on process and teams performances, no more (or not only) on individual performances. Ad hoc organization can be formed for scouting, networking, evaluating, financing or connecting external sources of innovation, as illustrated in the cases studied. Into collaborative relationships the key success factors are clear and defined objectives, pre-general confidential agreements and pre-joint development agreements, clear technology brief descriptions and technology submission formats for external potential partners and clear idea selection criteria (better if previously communicated in crowd sourcing initiatives).

New competencies and skills are also needed at the individual level, such as an extroversion attitude, the capability to be entrepreneurial, the capability to be comfortable with collaboration and develop both a technical and business mindset, a leadership vision and the capability to naturally and routinely develop network and seek external potential solution providers (i.e. internal experts, for example inside the internal network of the company before to seek external problem solvers). Last but not least, due to the possibilities created by IT tools, a certain level of Web 2.0 tools literacy is a skill that people need to master. Finally, a common evolutionary path can be traced thanks to the longitudinal study of the cases considered.

RQ3: What are the patterns they followed to build such capabilities?

Each case had a clear sponsorship from the CEO and top management and had already implemented an internal collaboration and information sharing program as antecedent to a structured external collaboration plan.

Due to the complexity of the phenomenon managed, dedicated organizational structures and roles for open and collaborative innovation have been implemented.

A strong focus on a continuous maintenance and improvement of the internal invention and development capability is the key to the ability to easily access the right external sources of innovation and, not secondary, to be recognized as a qualified and capable partner. In some cases the final goal is effectively become the preferred partner among others alternatives available in the network.

When companies structured its open innovation and crowd sourcing-like initiatives, the winning practices suggest to identify clear goal setting and process rules, and clear connecting points with external potential partners (website, portal, organization structure, general confidential and pre-joint development agreements).

Along all phases of this process a learning and open minded attitude is a must, IT infrastructures and supporting tool are essential to share, store, search for, organize and nurture information and knowledge.

7. Limitations and further research

This study analyzed the patterns followed by companies to build their dynamic innovation capabilities in a highly competitive environment, in which they cannot rely only on their core capabilities because they do not have enough time (and often financial resources) to internally integrate all the competencies needed to innovate.

The competition moves therefore from single companies to the whole supply chain and networks. The advantages of supply chain collaboration have been already studied in the academic field. Defee and Fugate's model (2010) proposes a path to develop necessary dynamic capabilities to properly compete in a continuous changing environment. The model proposed with this study aims to extend the considerations advanced in Defee and Fugate (2010) in order to comprise the innovation process.

Instead of relying on transaction cost considerations to either make or buy knowledge in open innovation processes, firms often simultaneously rely on their inventive and absorptive capacities in exploring knowledge (Cassiman and Veugelers, 2006).

Previous research on inter-organizational learning emphasizes the process of absorbing and integrating knowledge and capabilities from a dyadic perspective (supplier-customer relationships, or other dyadic collaborations), *knowledge accessing* and *co-evolving* suggest it may be more efficient and effective for each network partner to acquire an understanding of other's knowledge and capabilities belonging to an "extended network", including temporary weak ties or creating new ones (see crowd sourcing phenomenon, for instance). This allows companies to exploit the capability and activities performed by the most appropriate member in the innovation network, increasing the overall success of the network itself.

The case studies helped to sustain the research propositions exposed in chapter 6 (see pp. 122). Because of the exploratory nature of the study, the research propositions should be tested with more empirical data, considering multiple case studies and extending the research on inter-organizational learning (Bessant et al., 2003; Lukas et al., 1996; Pappu and Mundy, 2002; Powell et al., 1996). Further, the model addresses long-term phenomena,

making a longitudinal approach appropriate. Specifically, non-experimental survey methodology (Kerlinger and Lee, 2000) would be appropriate, interviewing managers involved with inter-organizational collaboration practices along the company's innovation processes.

Another interesting future research opportunity is to investigate the internal cost associated with developing new capabilities and upgrading existing capabilities to better understand the most profitable timing in reconfiguring static capabilities. Eisenhardt and Galunic (2000) make the case that dynamic capabilities are best suited for fast paced, rapidly changing industries.

Furthermore, future research should attempt to test the research propositions in a variety of contexts with a high rate of innovation. The model constructs need to be further developed and empirically tested, and valid measures for each relationship identified should be created. Qualitative methods may also be useful in identifying other forms of dynamic capabilities that might exist in the network environment.

8. References

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12. Exhibits

Exhibit 1. List of blogs

Blog	Owner	Website	Description
15inno by Stefan Lindegaard	Stefan Lindegaard	http://www.15inno.com	15inno by Stefan Lindegaard helps innovation leaders with their challenges and issues through peer-to-peer networking groups and learning sessions
Working Knowledge®	Andrea Meyer	http://workingknowledge.com/blog/	Andrea Meyer writes and ghostwrites about innovation, social media and strategy. Clients include MIT, Harvard Business School, McKinsey & Co., Forrester Research and McGraw-Hill. She founded Working Knowledge® in 1988
Blogging Innovation	Braden Kelley	http://www.business-strategy-innovation.com/wordpress/	Braden Kelley is an American popular writer, speaker, and consultant on innovation and marketing management
I'm Not Actually a Geek	Hutch Carpenter	http://bhc3.wordpress.com/	Hutch Carpenter is VP of Product for Spigit (http://spigit.com), Spigit helps companies manage innovation, providing idea management and prediction market software for enterprises. The goal is enable easy capture of ideas by employees, customers and partners, and convert the most promising to innovative initiatives
Innovation Coach	Robert F. Brands	http://www.innovationcoach.com/blog/	Robert F. Brands is President and founder of Brands & Company, LLC. Having gained hands-on experience in bringing innovation to market, creating and improving the necessary product development processes and needed culture, he delivered and exceeded to bring “at least one new product per year to market” resulting in double digit profitable growth and shareholder value.
24/7 Innovation	Stephen Shapiro	http://www.steveshapiro.com/blog/	Stephen Shapiro is one of the foremost authorities on innovation culture, collaboration, and open innovation. Business Innovation Speaker, Author and Consultant. In addition to speaking and writing, Stephen is the Chief Innovation Evangelist for InnoCentive, the leader in open innovation.

Exhibit 2. List of LinkedIn professional groups

LinkedIn Group	Innovation People Expert Innovators Creative Network
Owner	Gerald "Solutionman" Haman
URL	http://www.linkedin.com/groups?about=&gid=32614&trk=anet_ug_grppro
Description	Innovate with innovative and creative professionals and innovation experts from around the globe. Join thousands of members to learn and share best practices and advice from one of the largest Linked Innovation Groups organized by Gerald "Solutionman" Haman, founder of SolutionPeople.com.
Members	12.032
Created	September 27, 2007
Type	Networking Group
Website	http://www.innovatorsdigest.com
LinkedIn Group	Open Innovation and Crowdsourcing
Owner	Alexander M. Orlando
URL	http://www.linkedin.com/groups/Open-Innovation-Crowdsourcing-1851951?trk=myg_ugrp_ovr
Description	In addition, internal inventions not being used in a firm's business should be taken outside the company (e.g., through licensing, joint ventures, spin-offs, In contrast, closed innovation refers to processes that limit the use of internal knowledge within a company and make little or no use of external knowledge.
Members	5.151
Created	March 17, 2009
Type	Professional Group
Website	http://www.innovahub.com
LinkedIn Group	Innovation Excellence
Owner	Braden Kelley
URL	http://www.linkedin.com/groups?about=&gid=1953902&trk=anet_ug_grppro
Description	Seeking to understand what it takes to make your organization more innovative? Join this group to find and share information about enhancing or creating a culture of continuous innovation excellence.
Members	4.495
Created	May 14, 2009
Type	Professional Group
Website	http://www.business-strategy-innovation.com/wordpress/
LinkedIn Group	Enterprise 2.0 Group
Owner	Emanuele Quintarelli
URL	http://www.linkedin.com/groups?about=&gid=112679&trk=anet_ug_grppro
Description	A group to connect executives, consultants and other people passionate about the cultural, organizational and business impacts of introducing social media inside companies.
Members	3.249
Created	May 29, 2008
Type	Networking Group
Website	http://www.enterprise2forum.it
LinkedIn Group	15inno by Stefan Lindegaard
Owner	Stefan Lindegaard
URL	http://www.linkedin.com/groups?mostPopular=&gid=54595&trk=myg_ugrp_ovr

Description	15inno is a global network for people interested in open innovation and the intersection of leadership and innovation.
Members	2,467
Created	February 6, 2008
Type	Networking Group
Website	http://www.15inno.com
LinkedIn Group	Business Innovation Factory Community
Owner	Tori Drew
URL	http://www.linkedin.com/groups?about=&gid=39204&trk=anet_ug_grppro
Description	This is a group for collaborators in the Business Innovation Factory community, including BIF members, Experience Lab partners, and Collaborative Innovation Summit attendees.
Members	442
Created	October 26, 2007
Type	Networking Group
Website	http://www.businessinnovationfactory.com
LinkedIn Group	IDEA Lab: Collaborative Innovation
Owner	Emily Riley
URL	http://www.linkedin.com/groups?about=&gid=3048930&trk=anet_ug_grppro
Description	The IDEA Lab organization is leading, facilitating, and fostering Collaborative Innovation processes and techniques to connect government R&D teams with external idea generators, collaborators, and solvers in complex technical areas stimulating new partnerships, creating new networks, energizing industry, influencing research and education, and building communities and centers of excellence.
Members	343
Created	May 14, 2010
Type	Non-Profit Group
Website	http://www.wbi-icc.com/

Exhibit 3. Most Innovative Companies, 2010, Fast Company

Rank, 2010	Rank, 2009	Company name	Rank, 2010	Rank, 2009	Company name
1	15	Facebook	26	new	Synthetic Genomics
2	9	Amazon	27	new	FiLife
3	4	Apple	28	new	Frito-Lay
4	2	Google	29	new	Alibaba
5	new	Huawei	30	new	MITRE
6	18	First Solar	31	new	HTC
7	new	PG&E	32	new	Diller Scofidio + Renfro
8	new	Novartis	33	new	Firstborn
9	33	Walmart	34	new	Sportvision
10	12	HP	35	10	Ideo
11	3	Hulu	36	new	Samsung
12	new	Netflix	37	new	Glam Media
13	27	Nike	38	new	Ngmoco
14	6	Intel	39	new	VNL
15	new	Spotify	40	new	Aldi Süd
16	45	BYD	41	new	Fast Retailing
17	5	Cisco Systems	42	new	Huayi Brothers
18	19	IBM	43	new	Athenahealth
19	11	GE	44	new	MVRDV
20	22	Disney	45	new	Alstom
21	new	Gilt Groupe	46	new	Quantcast
22	new	Indian Premier League	47	new	Good Guide
23	new	PatientsLikeMe	48	34	Microsoft
24	new	Grey New York	49	new	Politico
25	new	BMW DesignworksUSA	50	new	Twitter

Available at <http://www.fastcompany.com/mic/2010>

Exhibit 4. The 50 Most Innovative Companies, 2010, Bloomberg BusinessWeek, BCG

Rank, 2010	Company	HQ Country	HQ Continent	Stock Returns, 2006-09 * (in %)	Revenue Growth, 2006-09 ** (in %)	Margin Growth, 2006-09 *** (in %)
1	Apple	U.S.	North America	35	30	29
2	Google	U.S.	North America	10	31	2
3	Microsoft	U.S.	North America	3	10	-4
4	IBM	U.S.	North America	12	2	11
5	Toyota Motor	Japan	Asia	-20	-11	NA
6	Amazon	U.S.	North America	51	29	6
7	LG Electronics	South Korea	Asia	31	16	707
8	BYD	China	Asia	99	42	-1
9	General Electric	U.S.	North America	-22	-1	-25
10	Sony	Japan	Asia	-19	-5	NA
11	Samsung Electronics	South Korea	Asia	10	17	-9
12	Intel	U.S.	North America	3	0	12
13	Ford Motor	U.S.	North America	10	-12	NA
14	Research in Motion	Canada	North America	17	75	-6
15	Volkswagen	Germany	Europe	8	0	14
16	Hewlett-Packard	U.S.	North America	9	8	9
17	Tata Group	India	Asia	Private	Private	Private
18	BMW	Germany	Europe	-8	0	NA
19	Coca-Cola	U.S.	North America	9	9	1
20	Nintendo	Japan	Asia	-8	22	3
21	Wal-Mart Stores	U.S.	North America	7	6	-1
22	Hyundai Motor	South Korea	Asia	23	12	17
23	Nokia	Finland	Europe	-14	0	-37
24	Virgin Group	Britain	Europe	Private	Private	Private
25	Procter & Gamble	U.S.	North America	1	5	2
26	Honda Motor	Japan	Asia	-11%	-9%	NA%
27	Fast Retailing	Japan	Asia	17%	15%	0%
28	Haier Electronics	China	Asia	28%	22%	-15%
29	McDonald'S	U.S.	North America	15%	2%	10%
30	Lenovo	China	Asia	18%	-1%	NA

31	Cisco Systems	U.S.	North America	-4%	8%	-6%
32	Walt Disney	U.S.	North America	0%	2%	0%
33	Reliance Industries	India	Asia	21%	23%	-4%
34	Siemens	Germany	Europe	-3%	-4%	27%
35	Dell	U.S.	North America	-17%	-4%	-7%
36	Nestle	Switzerland	Europe	8%	4%	1%
37	British Sky Broadcasting	Britain	Europe	6%	9%	-10%
38	Vodafone	Britain	Europe	6%	17%	-13%
39	J.P. Morgan Chase	U.S.	North America	-2%	18%	-21%
40	Oracle	U.S.	North America	13%	13%	5%
41	Petrobras	Brazil	South America	18%	5%	-11%
42	Banco Santander	Spain	Europe	2%	-1%	8%
43	Fiat	Italy	Europe	-10%	-2%	-12%
44	China Mobile	China	Asia	1%	16%	1%
45	Goldman Sachs	U.S.	North America	-5%	6%	4%
46	Nike	U.S.	North America	12%	5%	2%
47	Htc	Taiwan	Asia	6%	11%	-11%
48	Facebook	U.S.	North America	Private	Private	Private
49	Hsbc	Britain	Europe	-5%	-7%	-45%
50	Verizon Communications	U.S.	North America	1%	7%	6%

Available at http://www.businessweek.com/interactive_reports/innovative_companies_2010.html

Exhibit 5: TR50 Most innovative companies, Technology Review, MIT

Company	Company structure	Company	Company structure
Energy Companies		Biomedicine Companies	
A123 Systems	Public	Alnylam	Public
American Superconductor	Public	AthenaHealth	Public
First Solar	Public	GlaxoSmithKline	Public
General Electric	Public	Illumina	Public
Nissan	Public	Medtronic	Public
Suntech	Public	Nanosphere	Public
Amyris	Private	BIND Biosciences	Private
Coskata	Private	Complete Genomics	Private
eSolar	Private	Fate Therapeutics	Private
Joule Biotechnologies	Private	Fluidigm	Private
Synthetic Genomics	Private	Pacific Biosciences	Private
Tesla Motors	Private	Computing Companies	
1366 Technologies	Private	Amazon.com	Public
Web Companies		Apple	Public
Adobe	Public	HTC	Public
Akamai	Public	Infinera	Public
Google	Public	Intel	Public
IBM	Public	iRobot	Public
Hulu	Private	Luxtera	Private
Obopay	Private	Plastic Logic	Private
StreamBase	Private	Tilera	Private
Twitter	Private	Materials Companies	
Ushahidi	Private	Applied Materials	Public
Yelp	Private	DuPont	Public
Zynga	Private	Prime View International	Public
		Novomer	Private
		Serious Materials	Private
		Solyndra	Private

Available at www.technologyreview.com/tr50

Exhibit 6. The global innovation 1000: how the top innovators keep winning, Booz & Co.

		R&D Spending 2009		Sales, 2009	Intensity (Spending as % of sales)
		\$US Mil.	Rank	\$US Mil.	
1	Apple	\$ 1.333	81	\$ 42.905	3,1%
2	Google	\$ 2.843	44	\$ 23.651	12,0%
3	3M	\$ 1.293	84	\$ 23.123	5,6%
4	General Electric	\$ 3.300	35	\$ 155.777	2,1%
5	Toyota	\$ 7.822	4	\$ 204.363	3,8%
6	Microsoft	\$ 9.010	2	\$ 58.437	15,4%
7	Procter & Gamble	\$ 2.044	58	\$ 79.029	2,6%
8	IBM	\$ 5.820	12	\$ 95.759	6,1%
9	Samsung	\$ 6.002	10	\$ 109.541	5,5%
10	Intel	\$ 5.653	13	\$ 35.127	16,1%

Available at

*http://www.booz.com/global/home/what_we_think/featured_content/innovation_1000_2010
p. 12*