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Marche, B.; Boly, V.; Ortt, R.

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OBSERVING NEW PRODUCT IMPACTS ON SECTORS VALUE CHAINS: THE CASE OF A FRENCH ELECTRONIC SME

MARCHE B.¹, BOLY V.², ORTT R.³

Abstract

As a new technology impacts both the company itself and its ecosystem, the aim of this study is to visualize the influence of SME's new products on its supply chain. We adopted a case study approach to explore how products can affect the structure of a supply chain. Using data about the organization of the company and its external supply chain (including customers, suppliers, distributors and partners), the research objective is a better understanding of the global influences of innovation on the supply chain structure. A methodology is developed to model the supply chain at different periods and observe the evolution within and across companies in that supply chain as a result of the chosen strategies. Thereby, the influence of the new product on the supply chain can be analyzed in detail. The results of this study reveals possible scenarios to design the new supply chain in which the company will evolve following the emergence of its new product. As a perspective, a methodology will be elaborated to help top managers to anticipate these impacts.

Key words: Innovation, Sectors, SME, Case Study, Data analysis

Introduction

The emergence of a new product impacts the company and its environment: the higher the innovation degree, the stronger the impact (Garcia and Calantone, 2002). The initial environment undergoes many transformations, often discovered by companies after launching. Firms that introduce a new product on the market should explicitly seek to understand, predict and plan the necessary transformation of their inner infrastructure and the potential impacts on their environment to achieve the full potential of their products. Thus a better understanding of the strategies, action plans and methodologies used by innovative successful SME remains a major concern. Moreover a census of some ordinary transformations of the environment (pattern of change) due to new product emergence is required. Finally, it is necessary to collect more data about the relation between companies' decisions (anticipation of changes and adaptation to) and some external evolutions including the market structure. On a systemic point of view the research tries to explain the relation

¹ Lorraine University / ERPI (Equipe de Recherche sur les Processus Innovatifs), ERPI ENSGSI, 08 rue Bastien Lepage-BP 647, 54010 Nancy Cedex, France, brunelle.marche@univ-lorraine.fr

² Lorraine University / ERPI (Equipe de Recherche sur les Processus Innovatifs), ERPI ENSGSI, 08 rue Bastien Lepage-BP 647, 54010 Nancy Cedex, France, vincent.boly@univ-lorraine.fr

³ Faculty of Technology, Policy and Management, Jaffalaan 5, 2628 BX Delft, the Netherlands, J.R.Ortt@tudelft.nl

between an event, the emergence of a new technology, and two kinds of changes, inside and outside the company launching the technology.

In order to get a better understanding of all of these phenomena, we adopted a detailed single case-study design. A long term observation campaign has been organized with a highly innovative French SME. TEA is a company specialized in development, supply and implementation of physiological sensors for data measurement and analysis, related by physical activity, movement, eye-tracking as well as software of data treatment from the sensors. It operates on the market of ergonomic workstation.

TEA has its own set of sensors and different data treatment softwares, including CAPTIV elaborated by the National Institute of Research and Safety (INRS), the main French research center about work safety. CAPTIV is the result of a technology transfer. TEA focuses exclusively on niche markets, selling sensors and software of data treatment to the workplace ergonomics, neuromarketing, research domain, man-machine interface. TEA works in a sector where technologies quickly change: the market stimulates the company's activity and its capacity to innovate.

The company attests of expertise in R&D, management of technology and innovation. This combination of skills permits the company to propose a large range of products and to adapt to customers' needs. The company attests of a high rhythm of technological changes: an average of new technological system each five years. Each new project requires new competences: the company hires new employees, takes students in internship or organizes partnerships. As the company integrates a dynamic market, finding quickly the adapted skills represents a key success factor as well as inner change management.

This article is structured as followed. In the first section, the scientific background is presented. The methodology is detailed and experimental outcomes are given. The main phenomenon observed about the impacts of the new products and technologies of this SME on its environment are detailed. Finally, the analysis, conclusion and perspectives of this research work will be proposed.

Scientific background

Modeling the ecosystem

To better understand the changes in the supply chain, a system representation was adopted. The systemic paradigm represents a company as a complex system in three aspects in close interaction: its structure, its activity and its evolution. This representation is retained because an innovative company may be considered as a global, dynamic model, open to its environment.

Indeed, this model can provide several perspectives on a company (Le Moigne, 1990a, 1990b):

- (i) Global: to realize different views, links between actors in the product life cycle can be explored.

- (ii) Dynamic: to highlight the interactions that give life to the activity of the modeled organization
- (iii) Evolving: to account for changes within the company organization or its environment
- (iv) Open: to be responsive to information and resources exchanges in its environment in which the company operates

More practically and based on this systemic vision, numerous value chain approaches are developed in the literature to model a complex system and the interrelation with the external stakeholders, including: supply chain approach, the French *filière* approach, the Global Value Chain analysis... (Gereffi & al., 2001). More precisely, different approaches are possible to analyze particular relations between agents, each approach adopts a particular views: the technical perspective (input-output relationship), the organizational perspective (integration, specialization and types of exchange (competition, monopoly ...)) (Temple & al., 2011). However, all these notions are representative of the vision of their authors (economy, sociology, marketing ...)

For the following study, two notions seem to be relevant: the supply-chain and the French *filière*.

Studied perspective

The emergence of a new product has an impact on company activities (Schumpeter, 1934), on their skills, on the market as well as the actors belonging to the ecosystem (OCDE, 2005). Therefore, the concept of ecosystem has to be clearly defined and different perspectives may be considered.

An “activity” perspective

This perspective highlights the activities achieved by companies involved in the ecosystem.

(i) Chain Notion within the company: the Value Chain

The value chain is a “sequence of activities to produce a valuable product in the market”; it describes the range of activities that a company performs to bring a product from its design to its commercialization. Porter distinguishes nine generic categories of activities: infrastructure of the firm, human resource management, technological development, supplying, internal and external logistics, production, marketing and sales, and services (Porter, 1986).

(ii) Chain Notion across the company: the Supply-Chain

Several definitions are proposed in the literature concerning the supply chain. The supply chain can be considered as a network of companies participating in the different processes and activities, upstream and downstream, that create value in the form of products and services provided for the final consumer (Christopher, 1992). These interconnected organizations geographically dispersed over several sites that cooperate (Génin, 2003), are bound by physical, informational and financial flows (Stadtler & Kilger 2000).

The *filière* concept can be used in France to describe the concept of supply chain. It refers to a “necessary sequence of intermediate states of a good” (Arenas & al. 1988). Thus, the concept of *filière* integrates a material dimension, modeling the sequential transformation of

raw materials into a final product. The French *filière* concept has evolved since a few decades. Nowadays, a *filière* is considered as a set of firms belonging to different competitive spheres, interconnected by vertical, coordinated and cooperative relationships, contributing to the achievement of the same good, sharing a common representation of issues affecting demand, employment, financing and supply relationship (Assogba & Klebaner 2015). A *filière* is then an ecosystem with materials, stakeholders and specific knowledge. Comparing the concepts of supply chain and *filière*, it may be hypothesized that the set of firms represents supply chains whose production activities are segmented across multiple sites or countries (Génin, 2003) and are bound by physical, informational and financial flows (Stadtler and Kilger, 2000). Each activity contributes to value creation and is carried out where one finds technological skills, equipments, organization and materials at competitive cost. (Feenstra, 1998; OCDE, 2007)

The definition proposed below reflects our vision of the supply chain. The term supply-chain will be used throughout this article to characterize the external system in which the company operates.

A “skills” perspective

This perspective points out the importance of skills inside and outside the company during the new product development. Innovation represents one of the effective competitive strategies in business markets. This strategy builds up competitive advantage and also sustains it (Tidd, 2001).

The categorization of innovation dimensions as product, process or organizational allow defining the specific organizational strategy that a firm adopts to adapt to the market demand and to seize opportunities. Consequently, capitalizing on organizational capability and skills is a top management major concern (Filipini & Martini 2010).

There is a systematic relation between product and technology cycles and the demand for skills. The introduction of a new product by a firm may lead to emergence of less well-defined tasks. Uncertainty regarding expected outcomes requires higher-skilled workers with greater understanding about the production process and capacity to deal with unanticipated results. Once the properties of products, services and processes are better understood, they can be performed by less skilled workers. There are many examples in industries, among others chemicals, computing and atomic power, where initial production required highly qualified experts, but which subsequently use labor that may need only in-house training (Kim, 2002; Toner, 2011).

Human resource management relies on the concept of developing the workforce for maximal contribution to their enterprises and of thus ensuring a robust integration on their side. This feature renders human resource management a critical component for enterprises to achieve success (Baysal, 1993).

Human resource management may be defined as a body of functions and efforts which ensure effective and efficient management of human resources in any organizational and environmental setting in a way to contribute to organization, individual and environment, all in compliance with the applicable legislation (Kaynak, 1998).

As innovation impacts required knowledge inside and outside the company, the ecosystem may be considered as an evolving set of skills.

A “market” perspective

In this perspective the market is considered as the main compounds of the environment. Strategies are adopted by top managers to put in line the product and the market. Niche strategies are often described as a milestone in the commercialization of high-tech products (DeBresson 1995; Gerlagh & al. 2004; Hultink & al. 1997; Lynn, Morone, & Paulson 1996; Meldrum 1995; Moore 2002). A niche market refers to a relatively small group of customers with specific demands with regard to a product. There are no direct competitors; there is also a list of barriers preventing large scale diffusion.

Ortt and Schoormans (2004) propose a model which distinguished three phases in the development and diffusion process: innovation, adaptation and stabilization. The adaptation phase begins after the first application and ends when the product is standardized and widely circulated. (Ortt and Schoormans, 2004)

There is a different configuration of factors that seems to influence the emergence of early niches, defined as a niche application that emerges in the adaptation phase. Actors, factors or functions are required for large-scale diffusion: new high-tech product, production system, complementary products and services, suppliers (network of organizations), customers, institutional aspects, knowledge of technology, natural resources and labor, knowledge of application, socio-cultural aspects, macro-economic aspects and accidents or events (Ortt and Suprpto, 2011).

The first six of the factors described have a direct effect on the large scale diffusion of the high-tech product whereas the last six have an indirect effect, because they stand as prerequisite for one or more of the first factors. If one or more of the factors are missing, or otherwise forms a barrier to large-scale diffusion, then a niche strategy is required (Ortt and Suprpto, 2011).

Ortt, Langley & Pals (2013) state that there are ten niches strategies to commercialize new high-tech products, where factors defined previously play an important role: Demo, experiment and develop niche strategy; top niche strategy; subsidized niche strategy; redesign niche strategy; dedicated system or stand-alone niche strategy; hybridization or adaptor niche strategy; educate niche strategy; geographic niche strategy; lead user niche strategy and explore multiple markets niche strategy (Ortt et al., 2013).

Research approach

In our study we focus on the company TEA. This company is chosen from among several companies interviewed for several reasons:

- (i) Its geographical proximity allowing intensive contact required for a detailed explorative case study.
- (ii) Its positioning in a single supply chain, ideal for a first overview of the different study perspectives, and to test the modeling mode.
- (iii) Its longtime collaboration with the ERPI (Research Team on Innovative Processes in France) allowing an in depth knowledge of the evolution of the company over time.

Note that we choose for a long-term observation campaign to observe the changes in the supply chain over the last 20 years. Several points are analyzed both internal and external:

- (i) Process related to the product: design, production, distribution, sales ...
- (ii) Resources mobilized at every stage (processes, knowledge, know-how, equipments ...).
- (iii) Identification of the main suppliers and customers.
- (iv) Flow between actors: material, information, financial...

Methodology

Data collection

The research includes the collection and analysis of documents collected these last twenty years: study report, report of product design meeting, audit report. These data are used to develop models that are confronted with the opinion of the CEO by interviews. There are five interview steps:

- (i) 1st step: modeling the initial supply chain

The outcome is a census of the actors from the supply chain and the associated activities:

- a. The suppliers: products, skills, technologies, flows ...
- b. The subcontractors: products, skills, technologies, equipments, flows ...
- c. The partners: skills, technologies, equipments, flows ...
- d. The distributors: skills, localization, market, flows ...
- e. The customers: relationships, sales mode, service, flows ...

- (ii) 2nd step: characteristics of the new product / service

The characteristics of the finished product, as well as the skills, equipments and technologies necessary for its development gives a set of marketing, technical and financial data about the company and its supply chain.

- (iii) 3rd step: Fit/misfit between the initial supply chain and the characteristics of the new product

The characteristics of this new product / service are compared to the initial supply chain to test if there is a fit or a misfit between them. The comparison takes into account the initial situation and the requirement of the new product in terms of: activity, skill, stakeholders and market.

- (iv) 4th step: Prediction of the future supply chain

As a result of the previous confrontations, two possibilities emerge:

- a. The future supply chain can be predicted and strategic actions to implement are visible for the CEO to move quickly from one supply chain to another

- b. The future supply chain cannot be predicted and an iterative process is essential to move from the old to the future supply chain.

(v) 5th step: Implemented strategies

This last step allows identifying implemented strategic actions to move from one supply chain to another.

The implemented strategic choices are described, considering the implementation time, the necessary skills, the relationships between actors, the influence of the environment, the market choice... In the introduction of the concept of the value chain, Porter presents the firm analytically through its production stages, offering the advantage to capture the interrelationships between all stages of manufacture of the product. It shows that, if decisions external to the firm are constrained by market, internal decisions (skills, technologies, equipment ...) depend on the leadership abilities to create and exploit sources of competitiveness (Porter, 1986)

The following figure summarizes the previous methodology:

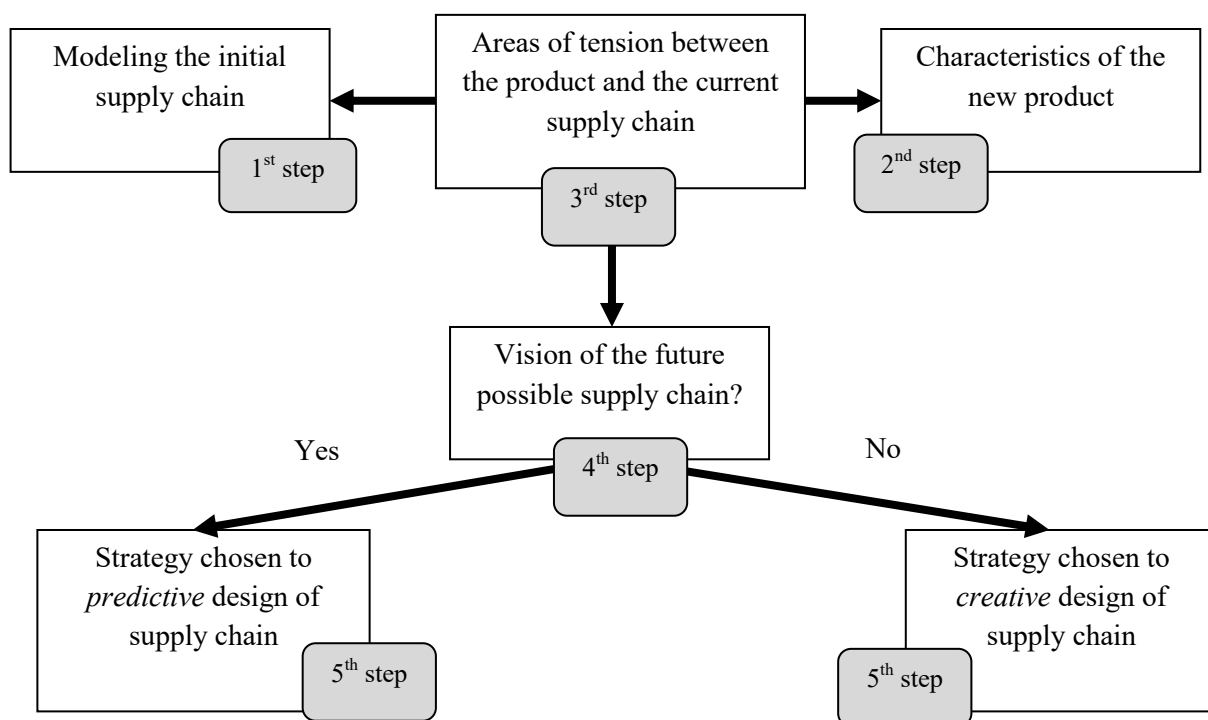


Figure 1: Methodology of Data Collection

Data processing

Several dimensions were studied while data processing to have a clearer vision of the path followed by the company to integrate a new supply chain.

(i) 1st dimension: Study of the company's value chain

First, the internal organization of the company has been analyzed on the basis of Porter's value chain. At each study period, the company's studied activities are transcribed and then, compared with each other to better understand the internal changes caused by the arrival of the product.

(ii) 2nd dimension: Study of the supply chain

An analysis from outside the company is conducted to understand the relationships between different actors. A particular attention is given to partnerships developed by the company to enhance its product. It is important to know the contribution to the project as well as the skills and resources they offer for the innovative company.

Data Modeling

The comparison of different activities at specific periods allows highlighting the supply chain evolutions as well as the associated strategies.

At each period, the supply chain associated with the product is modeled according to a systemic representation. Actors, flows and resources are represented. Then, each of these models is compared between each other and strategic actions implemented by the company are positioned on this representation.

Results inventory

After completing these models, results are identified in a table where each misfit is transcribed with the strategy implemented to model the new supply chain.

Outcomes

In this part, the results obtained during the interview are transcribed in chronological order:

Service Company

In 1985, the company, that is behind TEA, called FMA. It was a service company, which proposed a methodology of state variable research to characterize the operation of a industrial production system. Thus, it positioned itself ahead of companies that were developing automation systems for industrial sites. The company's activities were: carry out measurement campaigns, process the results of these campaigns, search for a model to automate and optimize the system.

It completed its knowledge on the application of electronics in complex environments thanks to the research provided by laboratories and the University (6 academic theses). It consisted of fifteen engineers in research and development. These customers belong to the fields of mineral processing, mineral extraction off, heavy chemistry and chemistry. The company has a few suppliers to get basis equipments (computers ...).

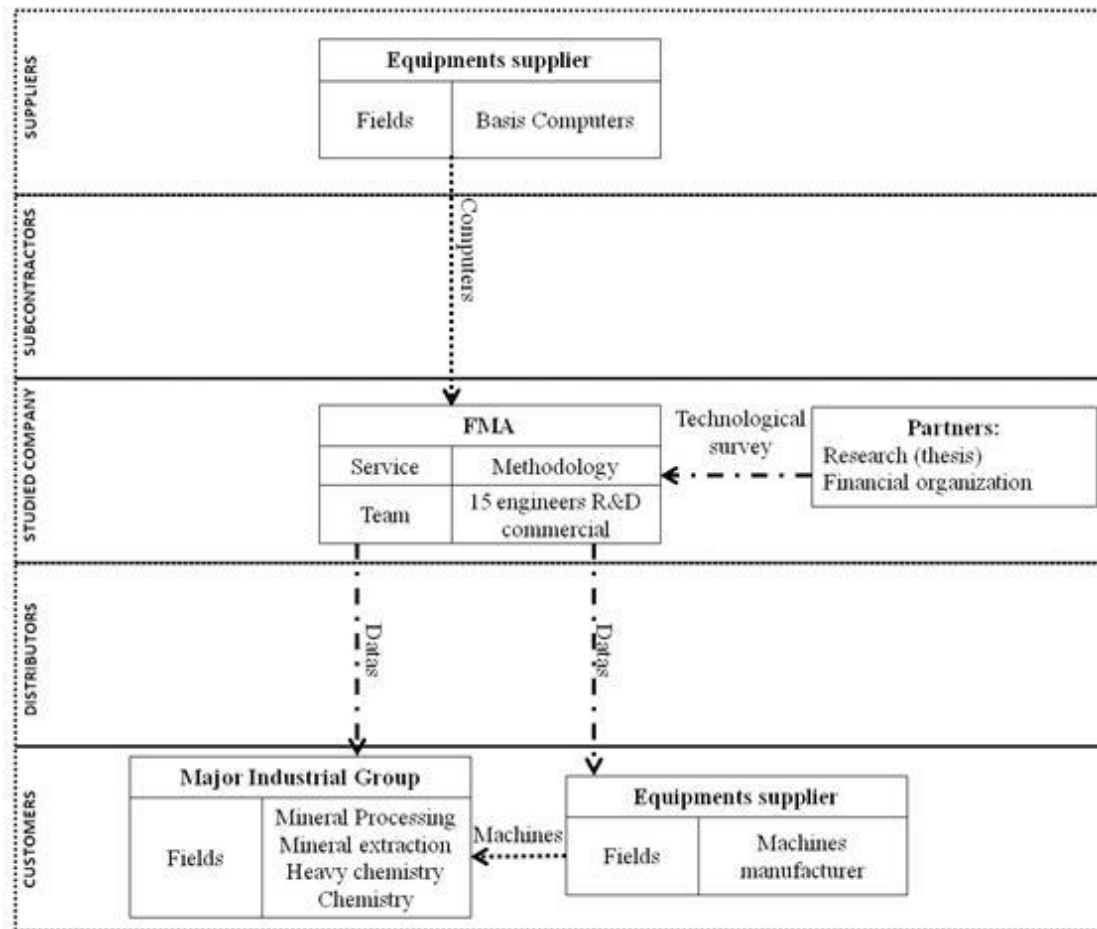


Figure 2: Modeling of the first supply chain

From service to product

In 1998, collaboration with the INRS, French Institute competent in the area of occupational risk prevention, allowed developing the acquisition central, CAPTIV that combines computing, measurement and video. This product is the result of the CEO's willingness to propose a product on the market. The company TEA is born from this decision and that of not blur the FMA's image with respect to its customers. This relationship with the research will be predominant in the development of the company. Indeed, technological survey will be constantly provided by the university world and research laboratories.

The TEA's team remained the same as the previous business even if the CEO had to convince the engineers of CAPTIV utility. The skills were the same and related to the measurement. Initially, the system simply allowed analyzing the pollution of a working environment. Customers were in contact with the health insurance funds: CARSAT (French organization on professional risk management), the CHSCT (French organization contributing to the protection of the health and safety of employees), an antenna of INRS, occupational health ... The transition between FMA and TEA has been gradual. The automation activity ceased after 10 years.

To propose a diversified offer, TEA was using sensor suppliers while it has developed gradually its own sensors. It used existing competitor products to integrate new markets and to position the own products. In this way, it was able to impose CAPTIV slowly and stop offering other components. During this period, the turnover was distributed in the following manner: 50% for automation, 40% for sensors resale and 10% for CAPTIV.

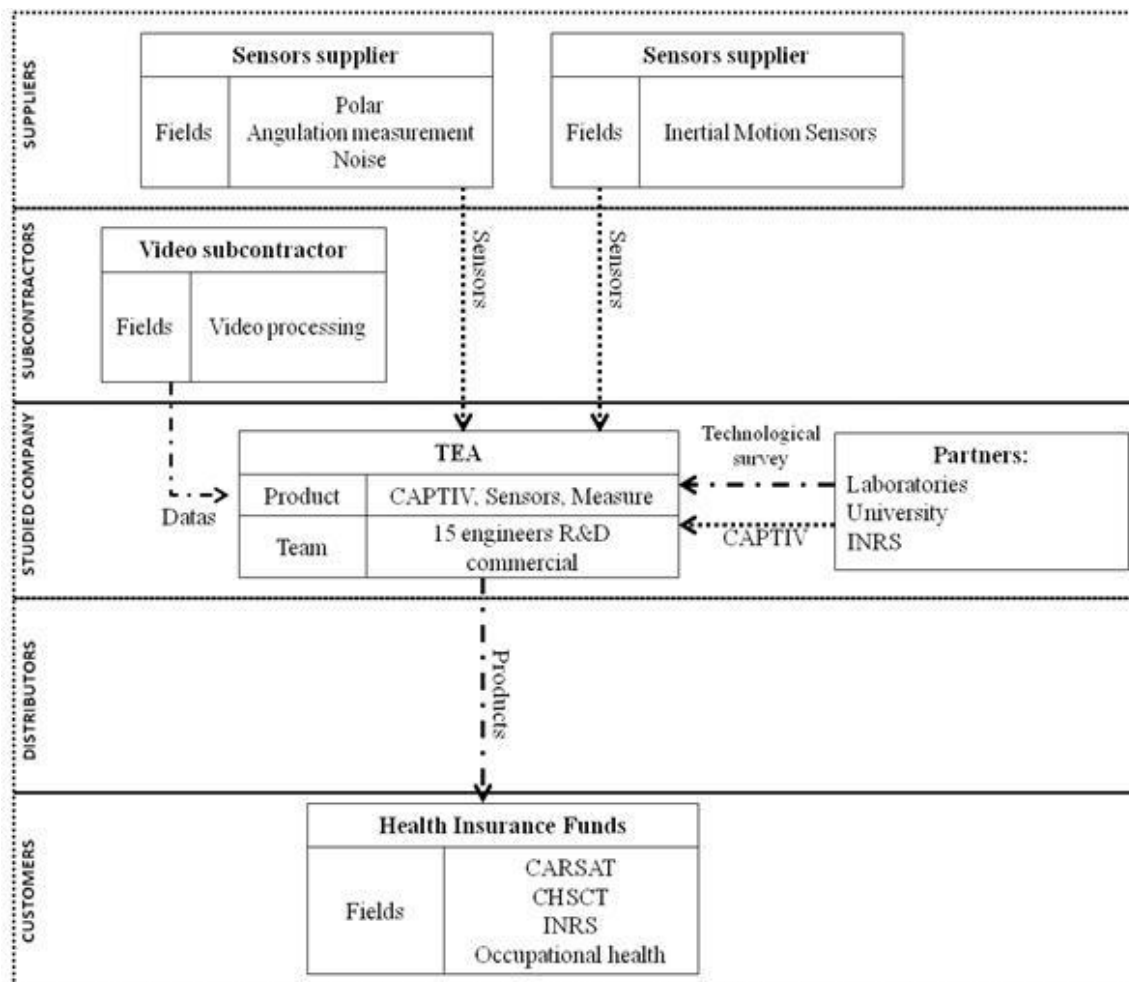


Figure 3: Modeling of the supply chain after the first change

Product improvement

Around the year 2005, TEA moved to embedded systems. It really distinguished itself thanks to its own range of sensors and wireless systems. To go through this period, it had to hire news electronics and embedded electronics engineers. These skills were still rare at that time so the engineers were trained in these specific fields.

TEA's customers have changed with the emergences of new products. Public and private laboratories have become the final actors of the supply chain.

With the development of its own sensors, TEA is released from its suppliers. Paradoxically, thanks to its innovations, the previous sensors suppliers became the distributors of the

company's products. The company treated punctually with components suppliers, these come from France, Germany and the USA while the battery suppliers come from China.

Today, CAPTIV represents 60% of sales while the sensors resale is 40%. TEA maintains an active technology survey thanks to its collaboration with universities and laboratories. This collaboration is useful to develop smaller, more autonomous, more robust components to better position to lower prices.

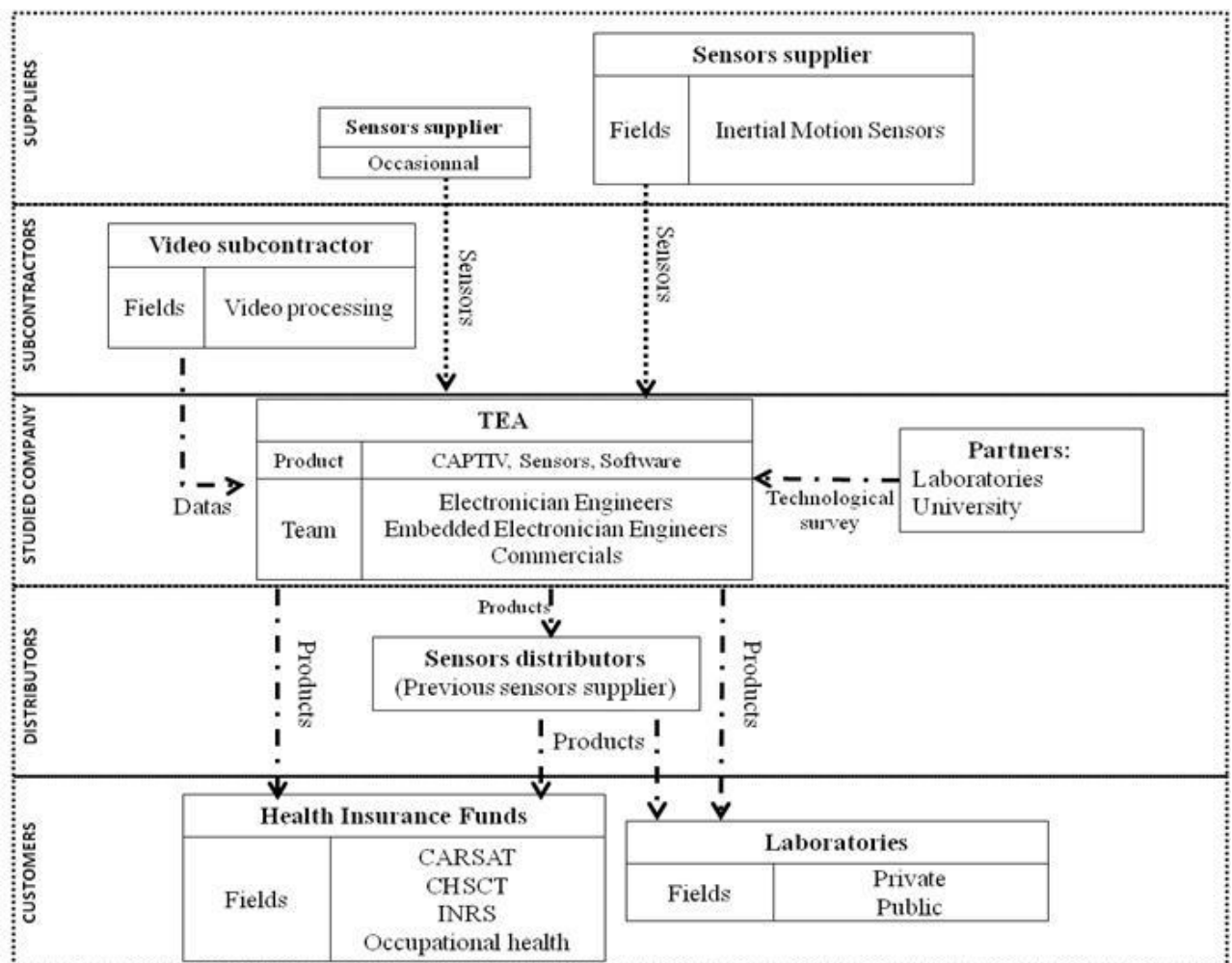


Figure 4: Modeling of the supply chain after the second change

Creating a service company

TEA integrates various markets with the expansion of its products range. Therefore, it wishes to offer a service based on its flagship product, so it is creating a service company. TEA will become the supplier of this new firm and a sales team will be responsible for selling the various services range.

Some products are very successful and TEA considers integrating a mass market via a subscription system. Current returns help to continually update the products that will improve with a little more sophisticated processing software.

Several anomalies were solved thanks to collaboration with a PhD student. This service will be able to carry back information from the market and thus, provide a better usage understanding.

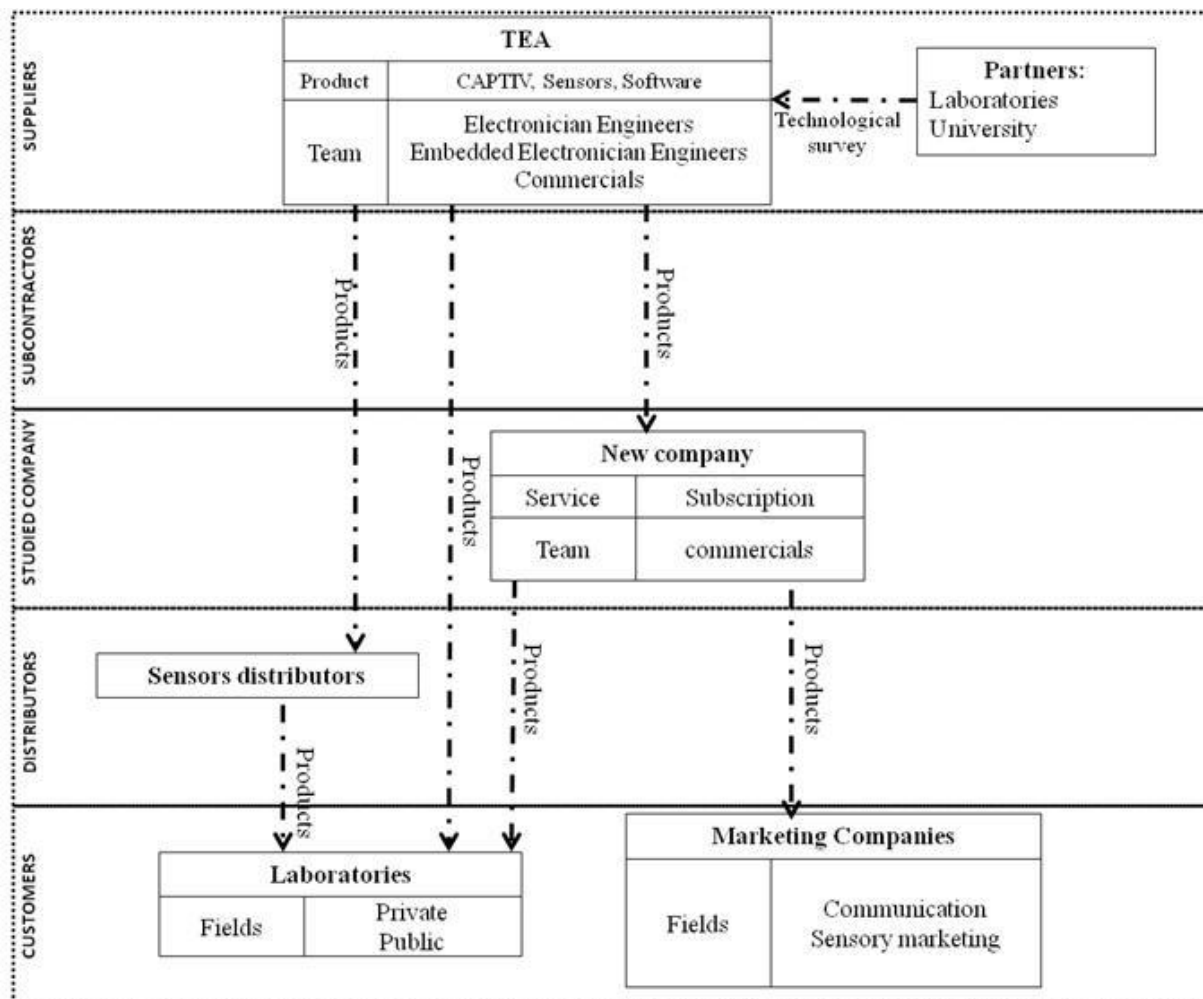


Figure 5: Modeling of the supply chain after the third change

Discussion

In this part, strategies implemented in each supply chain transition will be explained. The CEO relates the reason for his choices and constraints that he met in his company's evolution.

From service to product

Implemented strategies are the following:

Creating a new company

The original company proposed a methodology to its customers, so it was a service company. The emergence of a new product significantly affected the company's value chain. To maintain a coherent image to the customers, one of the company's executives, the current TEA's CEO, chose to create a new company, developed around this innovative product despite diverging opinions of these collaborators. According to him, each activity needs to have an accurate picture not to disturb the customer. Create a new company is affordable in France and allows supporting these strategic actions.

Research partnerships

The company regularly maintains its relations with the research world (laboratories, university ...) to dispose of the academic potential. Indeed, the research community has the capacity and time to organize a technological survey. According to TEA's CEO, the capitalization of research actions is very important. TEA needs knowledge, skills and human resources and universities bring specific staffs, students, PhD Students... to meet company's needs. In addition, teacher-researchers play a primordial role in the enhancement of the SME because they allow expanding its network and sharing information.

According to TEA's CEO, collaboration with the research community requires a real expertise in a SME. It's a relational investment. Laboratories need publications, so the company can propose a lot of research projects to develop its own activity if it knows to find the right interlocutor.

The partnership with the university varies according to the company's needs as well as the time allocated to the project. A collaboration based on a thesis allow deepening one subject during three years while a short collaboration with a high school leads to a technological survey on one subject.

For FMA, collaboration was in the form a thesis to develop many models. The product CAPTIV has its origin in an internship. To integrate a future mass-market, TEA works with a PhD Student to improve and finalize its flagship product.

Adopt the right agenda:

From the start of the company TEA, the team wanted to automate studies as they do today. However, markets and technologies were not enough evolved to accept such a huge change, it was still "the paper age" according to its CEO. He forecasted the future supply chain but the environment was finally not positive. As a consequence he had to design and transform

gradually the supply chain in which it operates today. In parallel, some basic elements foster the development of new products::

- (i) The CEO's profile: The CEO major concern is studying technology emergence, being able to understand its potential and to have a clear vision of the future environment. In addition, he has to have the willingness to innovate and take risks .
- (ii) The inner functioning: Firstly, learning is crucial in a company. With the CEO's support, employees try, test, admit mistakes among others tasks. Secondly, expertise transmission between generations is important. In our case study, the CEO states giving the « gene of University » to its engineers.

Product improvement

Implemented strategies are the following:

Skills acquisition

The transition to wireless sensors marked a further step for the company which it has grown in importance in the supply chain. Indeed, it was able to anticipate changes in offering the products that it has developed. Thus, it had to acquire skills to strengthen its leading position. Relationships with the research community were profitable to the company to determine the necessary skills for product improvement. Meanwhile, it has hired engineers to meet its skills needs.

Indeed, at the origin of CAPTIV, the company had the skills to bring value to the product. FMA's engineers had expertise in the measure that was helpful with the acquisition system, CAPTIV. New specific profiles were necessary during the transition to the embedded systems. The company had to hire engineers in embedded electronics. This type of profile only appeared on the market and the company had to train them because only few profiles were specialized in the embedded system measurement.

TEA works in a dynamic market, so the team needs a lot of energy to well-perform. There are two possibilities: whether the person has the ability to regenerate and can keep on working in the company or the CEO supports him to leave the company to regenerate elsewhere. This results in a dynamic skills rotation within the company and contributes to its performance conservation.

Similar products resales

TEA operates in a very dynamic market where customers quickly change. The company proposed other supplier's products (sensors, components...) in a field that was closed to it. In this way, the firm was able to integrate new markets while it fleshed out its own range. Gradually, the offer has become more consistent and the products of other suppliers are replaced by products owned by TEA which integrate these new markets.

Upstream vertical integration

During the company creation, many sensors were bought to suppliers, even if TEA had its own range of sensors. In the finished product (CAPTIV and sensors), the sensors price was

high thereby significantly reducing the company margin. Therefore, TEA wanted to reduce the number of components from suppliers. It has gradually expanded its range to become increasingly autonomous during the transition to the embedded system. In this way, sensor suppliers disappeared. Some components, such as batteries, are still purchased from other companies that it's the core business.

The previous component suppliers have kept their place in the supply chain, but as a distributor. Indeed, following the autonomy taking of TEA, component suppliers were interested by their range of sensors and are available as a reseller. The company didn't need to invest in a reseller network, the other actors have responded to protect their role on the supply chain.

Creating a service company

Implemented strategies are the following:

Creation of new company

Today, the range based on CAPTIV is well-developed. To keep on evolving, the company wants to build up a service offer where CAPTIV is the central element. The impact of this decision is twofold. Firstly, the company can adapt its product following the order that it has received. CAPTIV is the base product and engineers work to meet the customers' needs in adapting the product. In this way, the range of service expands. Secondly, this service will allow up information from the market. It's the service that will give a better understanding of usage to integrate a mass-market in the future. Indeed, the customers' feedback will allow the company being a force for bringing forward proposals. TEA's engineers will seek to make smaller, more autonomous, more robust products.

Like the first time, creating a new company is useful to remain transparent for the customers. In this way, the customers understand the company's core business.

New commercial activity

The company can propose several different products, created around CAPTIV. To be effective, each commercial has only one product to sale. In this way, he acquires a real product expertise. It can be very difficult for a commercial to sale several products with different characteristic. All commercials don't have the ability to incorporate as much product information.

Supply chain evolution following the emergence of CAPTIV

This research with TEA is an exploratory case study. It aims at a better understanding of in situ phenomena and therefore, to target accurately a particular problematic related to the phenomena that occur within and across the company following the launch of a new product.

The case study allows observing the evolution of an innovative company within its supply chain. It leads to a better understanding of the impact of the product emergence within and

across the company. In addition, the strategic choices of a company affect its role in the associated supply chain. There are several working perspectives as a result of this study. They will be discussed later.

The research approach outcome is a representation of the supply chain model all along the evolution of the company, after a new product launching (figure 1). The aim is to develop a model at each evolution stage of the companies that are studied. So, each innovation launching is a model.

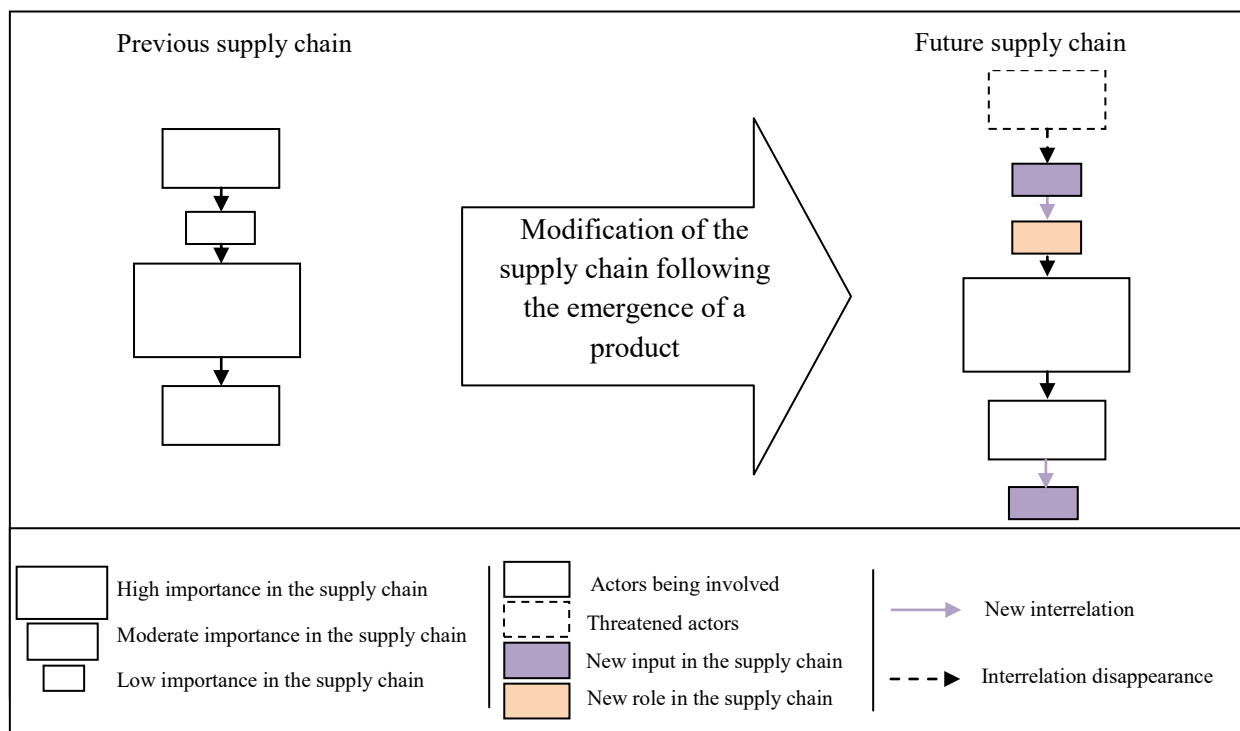


Figure 6: Impact on the supply chain

The following picture summarizes all implemented strategies that transformed the supply chain thanks to a systemic representation. All actors, who participates to the elaboration of the product, are represented and schematized according to their importances in the supply chain. Mutations within the supply chain are also modeled.

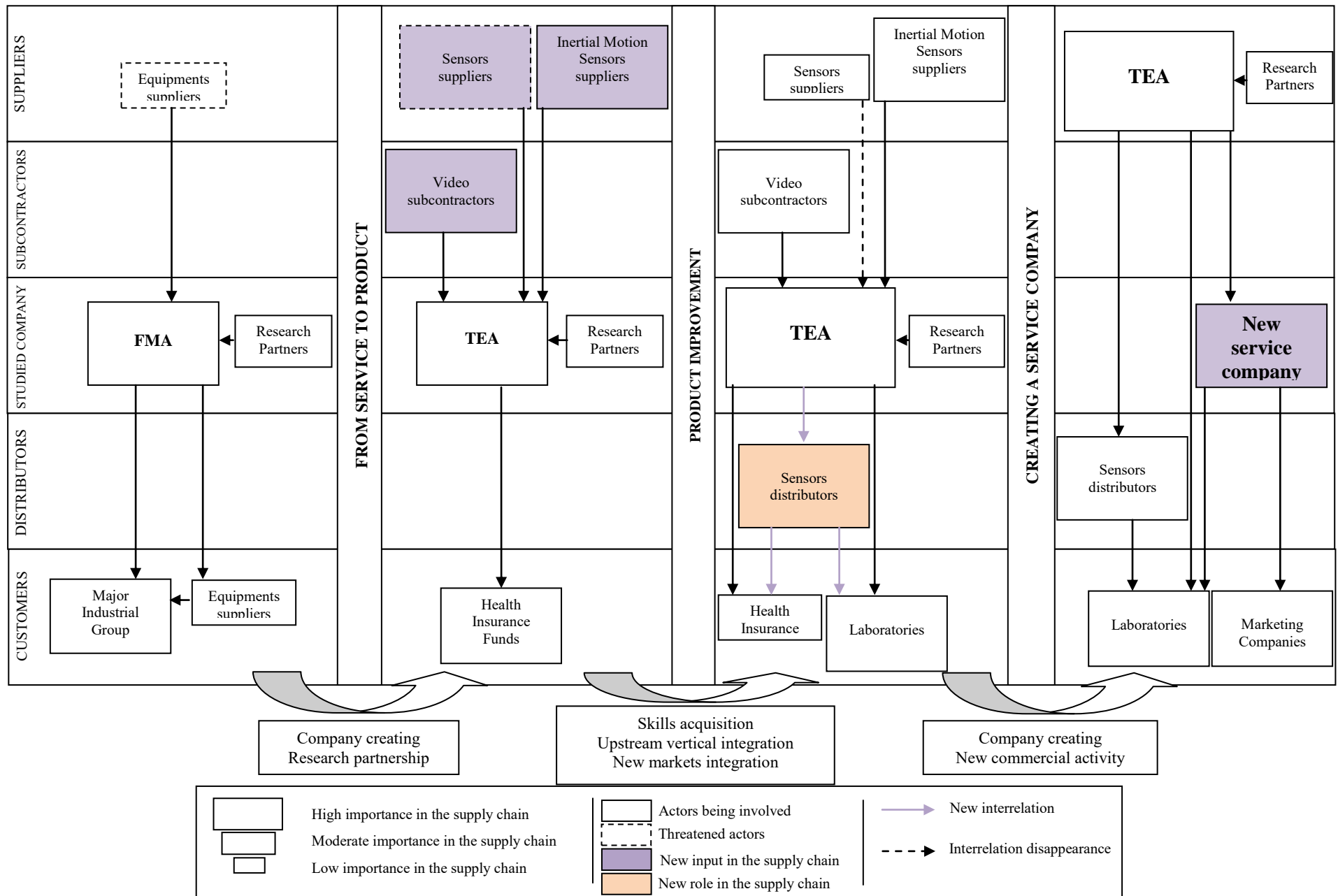


Figure 7: Modeling of all mutations within the supply chain due to TEA's strategic choices

Conclusion

The emergence of a new product or technology changes the supply chain in which it is inserted. Most of the time, the new product characteristics are not in adequacy with the initial supply chain. The methodology summarized in Figure 1 points out the difficulties encountered by the company to insert a new product in its environment. In our case study, although the CEO could predict the future supply chain, strategies chosen were the gradual introduction of changes to design the future supply chain. Indeed, the environment external to the company punctuated the passage of the initial supply chain to the current supply chain.

All strategies, impacting the supply chain, are classified in the following table. Each of the approaches are listed in one of the strategic perspectives defined at the beginning of this study.

Strategic perspective	Misfit	Implemented strategy
An “activity” perspective	New product in a service company	Creating a new company
A “skills” perspective	Limited resources to conduct technology survey	Research partnership
A “skills” perspective	Inadequate skills	Skills acquisition
A “market” perspective	Limited markets	Similar products resale
An “activity” perspective	Dependence of the company to its suppliers	Upstream vertical integration
An “activity” perspective	New service in a products company	Creating a new company
An “activity” perspective	Inadequate marketing method	New commercial activity

Table 1: Summary of strategic analysis

Within this research, the evolution of an innovative company within the supply chain and impacts due to the strategic choices are observed. Three perspectives were defined. The observation confirms the interest of these perspectives to explain the impacts. The supply chain notion integrates the three perspectives (activity, skills and market) and provides an interesting solid theoretical basis.

Thereafter, more representative models will be developed to visualize impacts and strategies. The resulting models will lead to the development of a methodology to anticipate impacts generated by the emergence of a new product.

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References

- Arena, R., Benzoni, L., Debandt, J., ROMANI, P., 1988. *Traité d'économie industrielle*, Economica.
- Arora, A., Gambardella, A., 1994. The changing technology of technological change: general and abstract knowledge and the division of innovative labour. *Res. Policy* 23 5 523–532.
- Assogba, G., Klebaner, S., 2015. Vers un cadre d'analyse institutionnaliste de la politique de filière: Quelle cohérence pour la politique de filière française ? *Cah. GREThA N°2015* - 26.
- Baysal, A., 1993. *Calisma Yasaminda Insan*. Presented at the I.U. Isletme Fak. Yay, Istanbul.
- Chetty, S., Blankenburg Holm, D., 2000. Internationalisation of small to medium-sized manufacturing firms: A network approach. *Int. Bus. Rev.* 9, 77–93.
- Christopher, M.L., 1992. *Logistics and Supply Chain Management*, Pitman Publishing. ed. Londres.
- Coviello, N.E., Munro, H., 1997. Network relationships and the internationalization process of small software firms. *Int. Bus. Rev.* 6, 361–386.
- Coviello, N.E., Munro, H., 1995. Growing the entrepreneurial firm: Networking for international market development. *Eur. J. Mark.* 49–61.
- DeBresson, C., 1995. the most likely diffusion sequence of a new technology through the economy: The case of superconductivity. *Res. Policy* 24, 687–705.
- Evers, N., Knight, J., 2008. Role of international trade shows in small firm internationalization: a network perspective. *Int. Mark. Rev.* 25, 544–562.
- Evers, N., O'Gorman, C., 2011. Improvised internationalization in new ventures: The role of prior knowledge and networks. *Entrep. Reg. Dev.* 23, 549–574.
- Feenstra, R., 1998. Integration of Trade and Disintegration of Production in the Global Economy. *J. Econ. Perspect.* pp. 31–50.
- Filipini, R., Martini, G., 2010. Strategic choice between process and product innovation under different competitive regimes. *Int Game Theory Rev* 12, 139–159.
- Garcia, R., Calantone, R., 2002. A critical look at technological innovation typology and innovativeness terminology: a literature review. *J. Prod. Innov. Manag.* 19, 110–132.
- Génin, P., 2003. *Planification tactique robuste avec usage d'un A.P.S - Proposition d'un mode de gestion par plan de référence* (Thèse de doctorat de l'Ecole des Mines de Paris).
- Gereffi, G., Humphrey, J., Kaplinsky, R., Sturgeon, T.J., 2001. *Introduction: Globalisation, Value Chains and Development*.
- Gerlagh, R., Van der Zwaan, B., Hofkes, M.W., Klaassen, G., 2004. Impacts of CO2-Taxes in an Economy with Niche Markets and Learning-by-Doing. *Environ. Resour. Econ.* 28, 367–394.
- Hagedoorn, J., Schakenraad, J., 1993. A comparison of private and subsidized inter-firm linkages in the European IT industry. *J. Common Mark. Stud.* 31 373–390.
- Harris, S., Wheeler, C., 2005. Entrepreneurs' relationships for internationalization: Functions, origins and strategies. *Int. Bus. Rev.* 14, 187–207.
- Hultink, E.J., Griffin, A., Hart, S., Robben, H.S., 1997. Industrial New Product Launch Strategies and Product Development Performance. *J. Prod. Innov. Manag.* 14, 243–257.
- Kaynak, T., 1998. *Insan Kaynaklari Yonetimi*. Presented at the I.U. Isletme Iktisadi Ens. Yay, Istanbul.
- Kim, Y.-H., 2002. A State of Art Review on the Impact of Technology on Skill Demand in OECD Countries. *J. Educ. Work* 15, 89–109.

- Kontinen, T., Ojala, A., 2011. Network ties in the international opportunity recognition of family SMEs. *Int. Bus. Rev.* 20, 440–453.
- Le Moigne, J.-L., 1990a. La modélisation des systèmes complexes, Dunod. ed, Afcet Système. Paris.
- Le Moigne, J.-L., 1990b. La théorie du système général, théorie de la modélisation, 3ème édition mise à jour, PUF. ed. Paris.
- Lynn, G.S., Morone, J.G., Paulson, A.S., 1996. Marketing and Discontinuous Innovation: The Probe and Learn Process. *Calif. Manage. Rev.* 38, 8–37.
- Meldrum, M.J., 1995. Marketing high-tech products: the emerging themes. *Eur. J. Mark.* 29, 45–58.
- Moore, G.A., 2002. Crossing the Chasm. Marketing and Selling Disruptive Products to Mainstream Customers. HarperCollins Publishers, New York.
- OCDE, 2007. Moving up the Global Value Chain, Policy Brief. L'observateur OCDE.
- OCDE, 2005. Manuel d'Oslo: principes directeurs pour le recueil et l'interprétation des données sur l'innovation. OECD Publishing.
- Ortt, J.R., Schoormans, J.P.L., 2004. The Pattern of Development and Diffusion of Breakthrough Communication Technologies. *Eur. J. Innov. Manag.* 7, 292–302.
- Ortt, J.R., Suprpto, M., 2011. The Role of Strategic Niches in Creating Large-scale Applications for High-tech Products. Presented at the Proceedings of 20th International Conference of the International Association for Management of Technology (IAMOT), Miami Beach, Florida.
- Ortt, R., Langley, D., Pals, N., 2013. Ten Niche Strategies To Commercialize New High-Tech Products. 2013 IEEE International Technology Management Conference & 19th ICE Conference. S. Cunningham, Ortt, J.R., Rezaei, J. & Salimi, N. the Hague. Presented at the 2013 IEEE International Technology Management Conference & 19th ICE Conference. S. Cunningham, Ortt, J.R., Rezaei, J. & Salimi, N. the Hague, the Netherlands, pp. 1–12.
- Porter, M., 1986. L'avantage concurrentiel, trad. InterEditions. ed. Paris.
- Rycroft, R., Kash, D.E., 2004. Self-organizing innovation networks: implications for globalization. *Technovation* 187–197.
- Schumpeter, J., 1934. The Theory of Economic Development, Harvard University Press. ed. Cambridge, Massachusetts.
- Stadtler, H., Kilger, C., 2000. Supply Chain Management and Advanced Planning: concepts, models, software and case studies, Editions Springer Verlag. ed.
- Temple, L., Lançon, F., Palpacuer, F., Paché, G., 2011. Actualisation du concept de filière dans l'agriculture et l'agroalimentaire. *Econ. Sociétés Dév. Croissance Prog.* pp. 1785–1797.
- Tidd, J., 2001. Innovation management in context: environment, organization and performance. *Int J Manag Rev* 169–183.
- Toner, P., 2011. Workforce Skills and Innovation: An overview of Major Themes in the Literature. OECD Sci. Technol. Ind. Work. Pap., OECD Publishing.
- Wernerfelt, B., 1984. A resource-based view of the firm. *Strateg. Manag. J.* 5 2 171–180.
- Zain, M., Ng, S.I., 2006. The impact of network relationship on SMEs' internationalization process. *Thunderbird Int. Bus. Rev.* 48, 183–205.