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Management Engineering



## **EARLY SUPPLIER INVOLVEMENT IN NEW PRODUCT DEVELOPMENT**

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**Academic Year 2018/2019**

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## **Abstract**

Even though the study of supplier involvement in NPD has been discussed widely, the topic still continues to grow, and this area of research is far from being abandoned. The primary purpose of this study is to analyze the involvement of suppliers in a New Product Development project and apply it in a real case. Secondly, how to enhance supplier driven innovation in New Product Development based on the company's relationship with the supplier. The criteria give a conceptual basis on the nature of innovative suppliers: specialized, technically competent, export-oriented firms, located in the proximity of the buyer, being embedded in a trusted and intensive relationship are identified as having a higher probability to be core innovative suppliers. These criteria can also serve to refine strategic sourcing decision and to enhance supplier driven innovation in NPD based on supplier firm relationship. The company which helped for this study is TONYSS ENGINEERING, one of the leading producers of dyeing machines. The project selected for this study was believed to be rich in information about the supplier's involvement in NPD. Data was collected through interviews with the company and some data were taken from the firm's website. A broad literature review is done in order to answer the research questions and to better understand the different aspects of early supplier involvement in New Product Development, its benefits, limitations etc. The report provides detailed study about the company and its structure, in-depth analysis of the purchase and the supply chain process and understand how the company is choosing its suppliers and involving suppliers in the new product development. Finally, based on the study, using the tools and theories suggestions were provided to improve the selection of supplier and to involve the supplier in the early stage of new product development.

## **Astratto**

Anche se lo studio del coinvolgimento dei fornitori nell'NPD è stato ampiamente discusso, l'argomento continua a crescere e quest'area di ricerca è lungi dall'essere abbandonata. Lo scopo principale di questo studio è analizzare il coinvolgimento dei fornitori in un progetto di sviluppo di nuovi prodotti e applicarli in un caso reale. In secondo luogo, come migliorare l'innovazione guidata dai fornitori nello sviluppo di nuovi prodotti in base alla relazione dell'azienda con il fornitore. I criteri forniscono una base concettuale sulla natura dei fornitori innovativi: le imprese specializzate, tecnicamente competenti, orientate all'esportazione, situate nelle vicinanze del compratore, essendo integrate in un rapporto di fiducia e intensivo sono identificate come aventi una probabilità più elevata rispetto al nucleo innovativo fornitori. Questi criteri possono anche servire a perfezionare la decisione di sourcing strategico e a potenziare l'innovazione guidata dai fornitori nell'NPD sulla base della relazione delle aziende fornitrici. La società che ha contribuito allo studio è TONYSS ENGINEERING, uno dei principali produttori di macchine per la tintura. Si ritiene che il progetto selezionato per questo studio sia ricco di informazioni sul coinvolgimento del fornitore in NPD. I dati sono stati raccolti attraverso interviste con la società e alcuni dati sono stati presi dal sito web dell'azienda. Viene fornita un'ampia revisione della letteratura per rispondere alle domande di ricerca e per comprendere meglio i diversi aspetti del coinvolgimento dei fornitori precoce nello sviluppo di nuovi prodotti, i vantaggi, i limiti ecc. Il rapporto fornisce uno studio dettagliato sull'azienda e sulla sua struttura, approfondita analisi del processo di acquisto e della catena di fornitura e capire come l'azienda sceglie i propri fornitori e coinvolge i fornitori nello sviluppo di nuovi prodotti. Infine, sulla base dello studio, sono stati forniti suggerimenti sugli strumenti e le teorie per migliorare la selezione del fornitore e coinvolgere il fornitore nella fase iniziale dello sviluppo di nuovi prodotti.

# 1. THE PROBLEM

## 1.1 Introduction

Companies rarely innovate by themselves. Innovation is the product of a network rather than of a single person or a firm. Now a day's companies do not rely only on their own technology and competencies to remain competitive in the market, they also started to realize the importance of suppliers apart from just delivering the products. Firms in many industries are facing increased global competition and are operating in markets that demand more frequent innovation and higher quality. One approach many companies are taking to gain a competitive advantage is to involve suppliers earlier in the design phases. Contemporary firms tend to focus on core process and outsource others from the suppliers, which may possess cost advantages. But the more technologies a new product requires, the firm needs to collaborate with the suppliers. There are several benefits in early involvement of suppliers in new product development such as improvement in design and product performance, lowering development cost, access to supplier new technology, lock out of competitors and others.

On the other hand, despite the number of benefits, some research found contradictory results and raised questions regarding the benefits of the early supplier involvement in NPD. Culley (1999) added that firms lack formal guidelines to aid them in decisions such as when to contact suppliers, when to involve suppliers in NPD process and the level of involvement of the suppliers in NPD process. Hence, the primary objective of this study is to analyze the supplier involvement in new product development and identify the best possible way to involve suppliers and apply it in the real case. The company we are going to analyze for this study is TONYSS ENGINEERING, one of the leading manufacturers of dyeing machines. The data is collected through interviews, firm's website and internal and external documents. The idea is to study the company's NPD project and provide possible areas of improvement and suggestions using tools and theories discussed along the study.



## **1.2 Problem Indication**

Now a day's companies are increasingly involving suppliers in their new product development process. This concerns the integration of the capabilities that the suppliers can contribute to new product development projects. Research suggests that supplier involvement in New Product Development could lead to higher innovation and even increase in the manufacturer's financial performance. However, there are also downsides on supplier involvement. Managing supplier involvement in new product development poses some challenges. Hoegl and Wagner (2005) found empirical evidence that not all managers support the positive effects of supplier involvement in new product development processes.

The purpose of this study is to identify the best possible way to involve the suppliers in an NPD project which will lead to the success. In order to perform that, brief study about the concept of supplier involvement in NPD project must be done.

## **1.3 Problem Statement**

Deriving from the problem indication, the following main question is determined:

*“How should companies construct a successful new product development process with supplier involvement?”*

## **1.3 Research Questions**

In order to answer the main question, the following research questions are formulated:

1. What is a new product development?
2. How can a supplier be involved in new product development process?
3. How to enhance supplier driven innovation in NPD based on supplier firm relationship?

## 2. LITERATURE REVIEW

### 2.1 New Product Development

NPD covers the complete process of bringing the new product into the market. In order to remain successful, organizations need to get new ones by a cautiously executed new product development process. Yet, they face an issue: in spite of the fact that they should develop new products, the chances weigh vigorously against success. Of thousands of items entering the process, just a bunch of them achieve the market. Subsequently, it is of pivotal significance to understand consumers, markets and competitors in order to create products that delivers high value to the consumers. Research suggests eight major steps in new product development process.



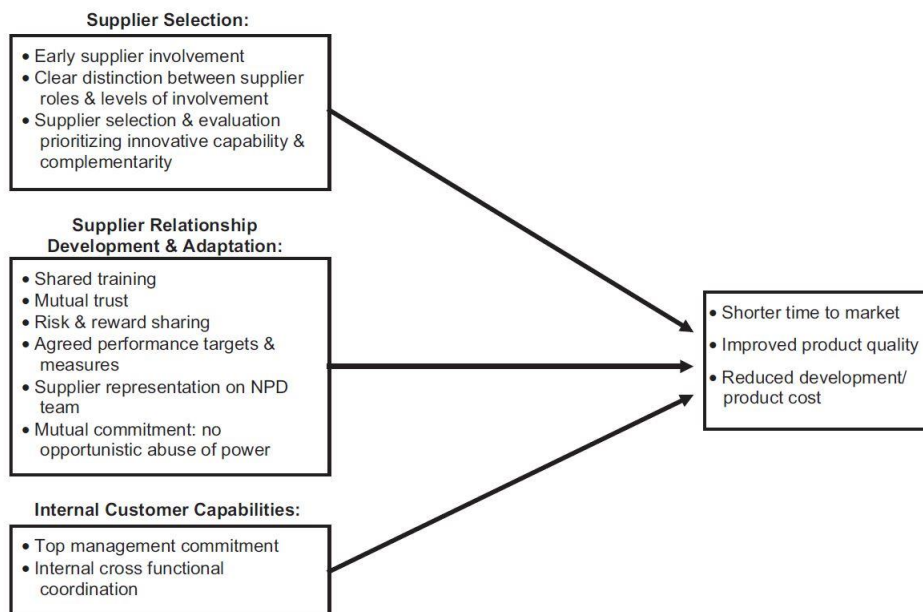
Figure 1: New Product Development Process

1. **Idea Generation:** This involves systematic search for new product ideas. Company generates hundreds and thousands of ideas to pick handful of good ones. Ideas good be generated internally (R&D, Company employees) or externally (suppliers, distributors, customers)
2. **Idea Screening:** Idea screening means filtering the ideas to pick the good ones. Dropping the poor ideas as soon as possible is of crucial importance.
3. **Concept development and Testing:** To carry out the new product development process, attractive ideas must be developed into new concepts. A product concept is a detailed version of the new product idea stated in the meaningful consumer terms.
4. **Marketing strategy development:** The next step is the development of marketing strategy. When a promising concept was developed and tested, its time for the design of initial marketing strategy for the new product based on the product concept for introducing the product to consumer market.
5. **Business analysis:** This process involves a review of sales, costs and profit projections of the new product to find out whether they satisfy the company objectives.
6. **Product Development:** Product development is the actual development of the product. The R&D department will develop one or more physical versions of the product. Developing a successful prototype may take days, weeks or months depending on the product and prototype methods
7. **Test marketing:** Test marketing gives the marketer experience with marketing the product before going to the expense of full introduction. It allows the company to test the product and its entire marketing program before full investment is made.
8. **Commercialization:** This is the final stage in the new product development process which is introducing the new product into the market. The main factors to be considered before the product is commercialized is the timing of introduction and introduction place.

## 2.2 Supplier involvement in NPD

According to van Echtelt et al. (2008) “Supplier involvement refers to the resources (capabilities, investments, information, knowledge, ideas) that suppliers provide, the tasks they carry out and the responsibilities they assume regarding the development of a part, process or service for the benefit of a buyer’s current or future product development projects”. Hence, supplier involvement is sort of collaboration between the firm and the supplier. Firms competing in emergent or competitive industries or trying new technologies will try to collaborate with the suppliers. The need to implement new technology into a product might require the collaboration of two firms. Successful collaboration with a strategic purpose involving a supplier in New Product Development includes trust, commitment, sense of fairness, early supplier involvement in design, joint collaboration and supplier reputation (Bensaou 1999). Both the buying firm and the supplier must strive to put their full effort in order to have a successful collaboration. It is beneficial for buying firms to involve suppliers in NPD projects because the firm’s product innovation improves (Lau et al. 2010). Furthermore, it is demonstrated that R&D collaborations with the suppliers have a more positive impact on product innovation than does collaboration with universities, customers or competitors (Un et al. 2010).

*T.E. Johnsen / Journal of Purchasing & Supply Management 15 (2009) 187–197*



*Figure 2: Factors affecting supplier's involvement success*

Successful supplier involvement requires customers to qualify and evaluate supplier capabilities, especially in terms of complementarity of capabilities and culture. Moreover, suppliers need to agree technical metrics and targets in order to ensure long-term commitment (Petersen et al., 2005). Overall, supplier relationships need careful nurturing for supplier involvement benefits to materialize trust takes a long time to develop but an instant to destroy through opportunistic behavior (Thomas Johnsen journal).

### 2.3 Timing of Supplier Involvement

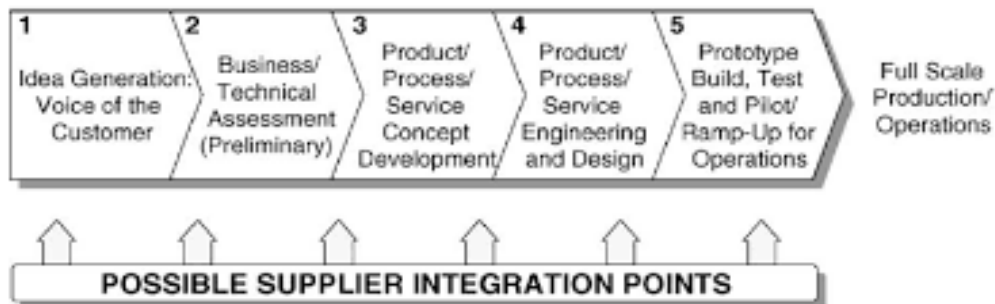
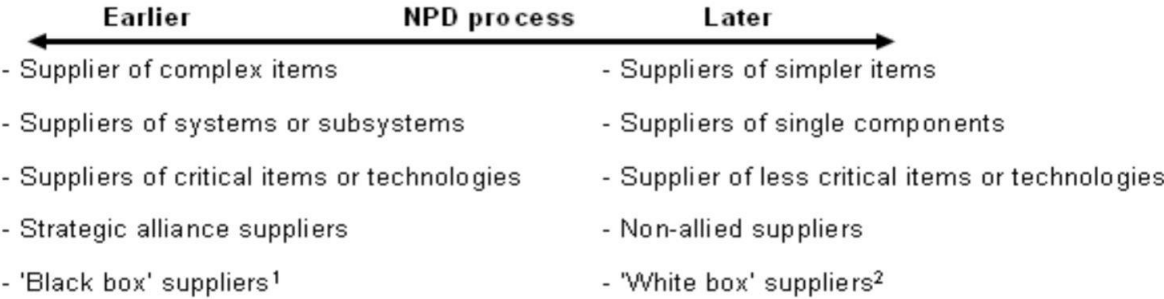


Figure 3: Possible supplier integration points in NPD

Wynstra and ten Pierick (2000) argue that supplier involvement may range from small design suggestions to the full responsibility of developing, designing and engineering of a specific part or sub-assembly. Involving suppliers seems to be an area where top manufacturers have set themselves apart, regardless of firm size, industry or type of manufacturing operations. However, there is room for improvement concerning supplier involvement regarding many firms, especially in design of the product. It is beneficial to involve suppliers early in the innovation process particularly at the design stage (Petersen et al., 2005). It is usually more costly and difficult to make changes to the specification of components downstream in the innovation process (Crawford and Di Benedetto, 2006, p. 296). Early involvement of suppliers in the design stage allows the supplier to ensure that they will be able to supply the components being specified in the innovation stage and to make required investment in equipment, tools and training where necessary. Involving suppliers in the design stage will also help in minimizing the design errors, which will be costly to make changes in the downstream of innovation process. It should also

result in more cost-efficient production and better-quality components more suited to the specific needs of the buyer.

Based on the research (Handfield et al., 1999), the figure represents the most common supplier integration points. The involvement of supplier depends on the preference of the buyer. It can be either in the idea generation or just in the prototype stage. Handfield et al., 1999 found that about 1/3 of their 121 respondents involved suppliers in the stage 3 and 45% of them in stage 1 and 2. Although this research is dated, it gives a reasonable insight about the situation at global operating companies. According to Parker; Zsidisin: and Ragatz (2008), the early supplier involvement followed by the Japanese manufacturers (especially in the automotive industries) helped them to enjoy competitive advantage over their U.S. and European counterparts. Clark (1989) Parker et al. (2008) discovered that a great amount of lead time and cost advantage that Japanese firms had was the result of intensive involvement of suppliers in the early stage.



*Figure 4: Integration of suppliers in NPD process*

The figure shows which type of suppliers should be involved in which stage of the New Product Development process. Clark and Fujimoto (1991) suggest that in order to involve supplier in the early stage, they should represent high value and complexity. It can be concluded that it is the choice of the buyer to decide whether to involve suppliers in the early or later stage. However, it is not a question of involving all suppliers earlier, but the right suppliers (Johnsen, 2009).

## 2.4 Degree of Supplier Involvement

Parker et al. (2008) suggest that the degree of supplier integration achieved is a function of existing relationship with the supplier, the importance of the item supplied and the timing of the supplier involvement. The supplier's degree of involvement or level of responsibility was conceptualized by Petersen et al. (2005) and varies from no involvement to: White Box (Supplier is informally consulted on the project), Grey Box (Joint development activity between the buyer and the supplier) or Black Box (design is primarily supplier driven based on buyer's requirements).

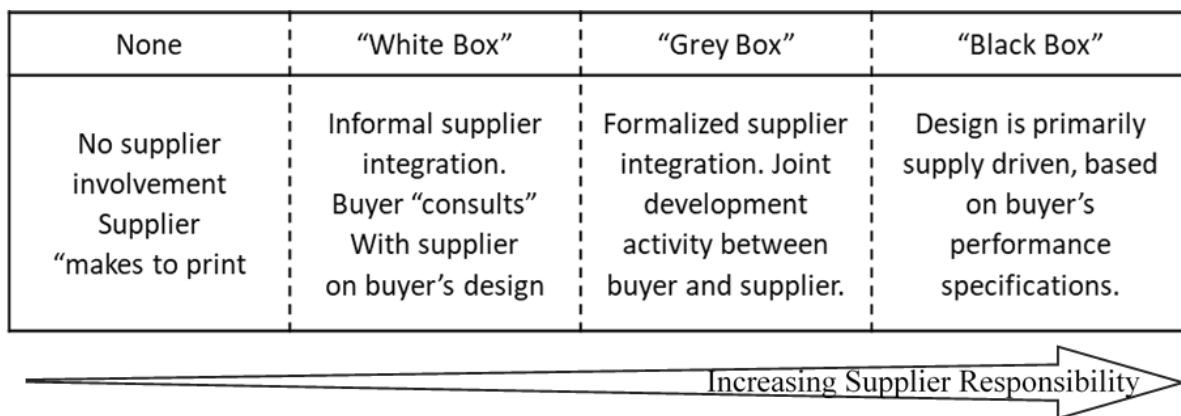


Figure 5: Spectrum of supplier integration

Handfield and Lawson (2007) explain it in more detail as follows:

- White Box: Here the buyer discusses with the supplier about specifications/requirements, but the buying firm make all design and specification decisions.
- Grey Box: The buyer and the supplier enter into a formal joint development effort which may include information and technology sharing and joint decision-making regarding design specifications.
- Black Box: Here the design is completely supplier driven. The buyer informs supplier about the customer requirements and then it is complete responsibility of the supplier for the purchased items.

Koufteros et al. (2007) findings highlight a positive direct effect of supplier grey box integration on product innovation. Also, supplier grey box integration was more important to product innovation than supplier black box integration. On grey box integration, supplier provides

suggestions and insights about alternative material specification, material cost, pricing and more which can be included in the start of the detailed product development process. The effect of supplier black box integration on product development and quality were not statistically significant (Koufteros et al., 2007).

A firm should involve suppliers depending on the complexity and technology of a specific item or process. However, they should also distinct between different suppliers (Wynstra and ten Pierick, 2000). A research in which the purchasing portfolio model of Kraljic (1983) shown in the figure was tested for planning supplier involvement in a development project.

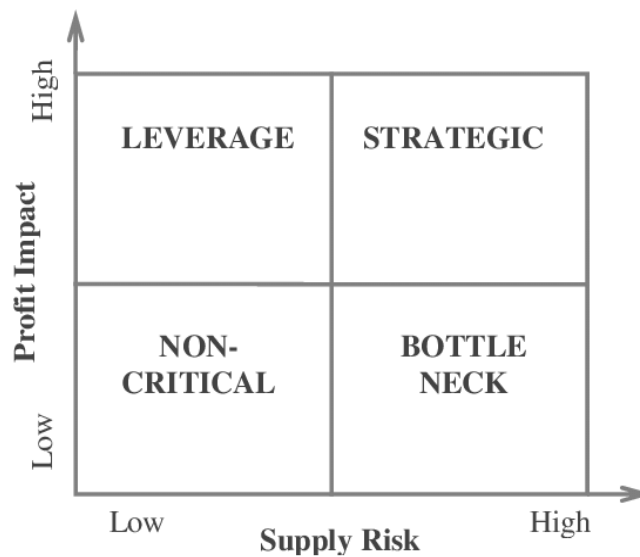


Figure 6: Purchasing portfolio matrix

In the model, Kraljic distinguishes 4 types of items:

- Non-critical items: These items are low risk and have a low impact upon organizational profitability. These items do not have a significant impact upon the business, nor does their absence represent a serious threat. Hence there are many suppliers as their supplier risk is low. In general, this kind of product requires 80% of purchasing department's time and generates less than 20% of the purchasing turnover.
- Leverage items: Where items have a high profitability but a low risk factor, buyers possess the balance of power in the relationship and leverage this strength to obtain greater returns. Suppliers can be easily substituted as their offerings are much the same and the



products can be bought from more suppliers. The only limitation for buyers is perhaps over-playing their hand and forcing a low-profit margin vendor into insolvency.

- Bottleneck items: Here the risk is high, but the profitability is low, and the suppliers have dominant power for these kinds of products. The market consists of few suppliers that can behave oligopolistically to force the price upward. The main strategy rests upon damage limitation.
- Strategic suppliers: These items are of high value for the buying company. It has a huge impact financially and has a high supply risk. Hence these items represent only a few suppliers. Strategic partners should focus on innovation of both product and process and in return they expect long-term commitment from the buyer.

The study of Wynstra (1998) found that in the actual development phase, suppliers of leverage and bottleneck items become involved and in routine items suppliers do not involve until the final stage of an NPD project. The suppliers of strategic items are involved early in the concept phase of New Product Development process.

However, Wynstra and ten Pierick (2000) conclude that the purchasing model of Kraljic (1983) did not identify the development risk of supplier involvement. Hence, they created a matrix which identifies the risks and responsibilities held by the supplier, named the Supplier Involvement Portfolio, shown in the figure

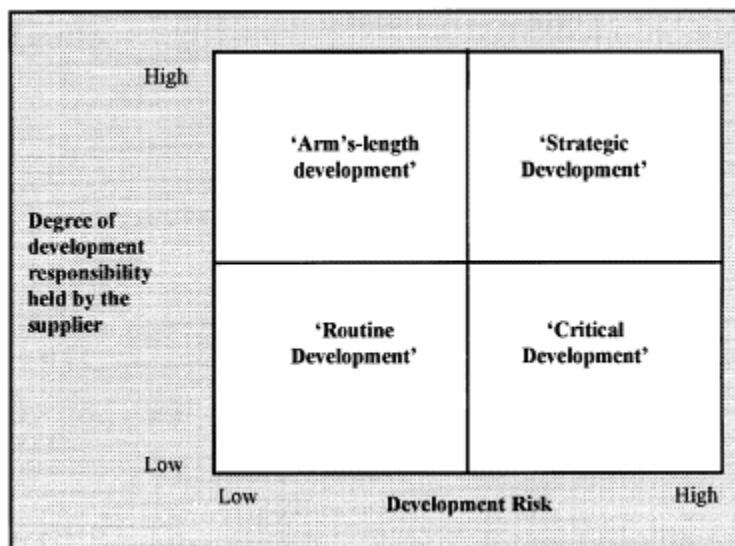


Figure 7: Supplier involvement portfolio

Wynstra and ten Pierick (2000) define development risk as 'the importance, newness and complexity of the successful development of the part concerned. 'This portfolio focuses only on the development of the products and distinguishes the certain involvement of a supplier. The four types of supplier relations; Strategic development, Critical development, Arm's-length development and Routine development are discussed below

- Strategic development: Due to the vague and imprecise information given by the buyer, the supplier deals with high level of uncertainty. The buyer has a high development risk which is why the buyer wants close involvement. To decrease this discrepancy the firms should communicate on every level with each other.
- Critical development: The development of the product is characterized by low responsibility for the supplier but high development risk for the buyer. The buyer wants to have concrete information. However, the supplier does not see the urge to share information and therefore the amount of communication is limited.
- Arm's-length development: It is characterized by a formal manner of contracts and a less close relationship compared with strategic development. Delivering information and a shared communication system is not that necessary as in Strategic development. The buyer experiences low risks, such that the supplier faces the risk. Which means the buyer does not see the urge to be involved.
- Routine development: Routine development has a low development risk and a low responsibility held by the supplier. The buyer organizes, co-ordinates and controls to ensure the prototypes are delivered on time. The relationship is based on keeping each other up-to-date. However, there is no elaborate shared communication system is needed.

### 3. CASE STUDY

#### 3.1 THE COMPANY

At Tony Engineering, they focus on providing Low Liquor Ratio Soft Flow Dyeing Machines with the highest level of customer satisfaction through sticking with the international quality. Tony Engineering's entered the textile industry in 1990 as a multi-product manufacturer like Dyeing winches, Hydro extractors, Tube dryer, Lab testing machine, Cabinet yarn dyeing machine, etc., Based on the tremendous endeavor, in 1997 TN 21 Series model Soft Flow Dyeing Machine was introduced. Factors like liquor ratio of 1:10 and the faultless design earned the decent reputation among the customers & sold over 100. Success of TN 21 series lead the way to release the further models like Eco 28, Eco 28 Super along with the shrunken liquor ratio of 1:8, 1:6 during 2002 & 2008 period respectively.

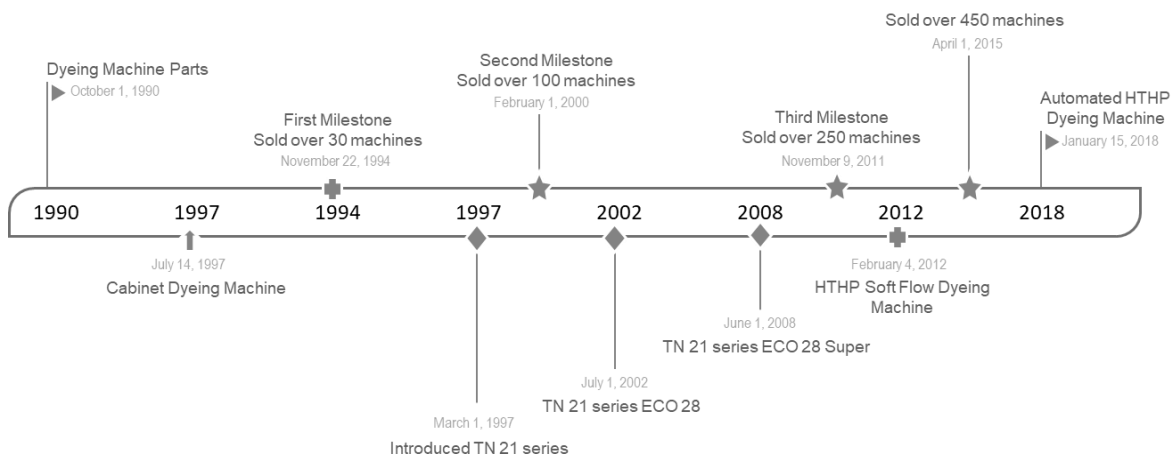


Figure 8: Company Timeline

Boosted sales graph around 450 of these two models induced Tony Engineering's R&D to gear up the experiments on liquor reducing concept & even more user-friendly automation, PLC human interface, double rope compatibility, etc., and successfully released the current generation Ecology Tech series model on 2010 with the reduced liquor ratio of 1:4.5. From then this model has sculptured continuously to improve the safety features & to achieve cent percent fabric loading efficiency for more than a year and introduced Ecology Tech1 series model in the mid of 2012. Technical features of this model have carefully designed to fulfill every aspect of

international market demand. In order to ensure the integral quality important accessories are acquired from the best manufacturers all over the world.

### 3.3 ORAGANIZATION STRUCTURE

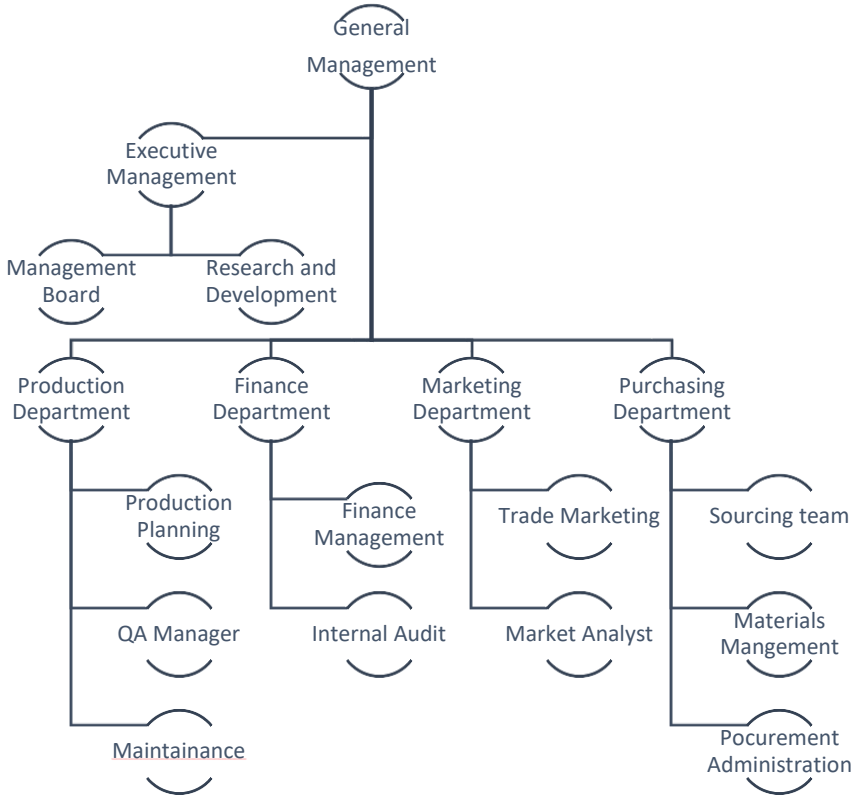


Figure 9: TONYSS Organization Structure

The main objective of this work is to analyze the suppliers and the PSM involvement in the TONYSS NPD process. Therefore, it is important to clarify, first of all, the actual relationship between technical functions and PSM.

### **3.4 DEPARTMENT AND THE R&D**

When a component is needed, the R&D gives the detailed specifications to the Purchasing department, which is in charge to place the order. The choice of the right supplier is completely up to the Purchasing department. The Purchasing department is divided in two units: the first purchases material for pumps, the other purchases supporting materials (machines, pipes, controller etc.).

- Quality
- Price
- Reliability
- Punctuality

Additional information on the evaluation of suppliers can be found in the Appendix B.

TONYSS adopts a Make to Order (MTO) strategy and started implementing advanced manufacturing process few years ago, with a consequent reduction of quality related problem in order to make the machine reliable. The responsiveness of the supply chain is crucial to avoid extra waiting time on customer side: the capacity to guarantee the agreed deadlines is a very important KPI.

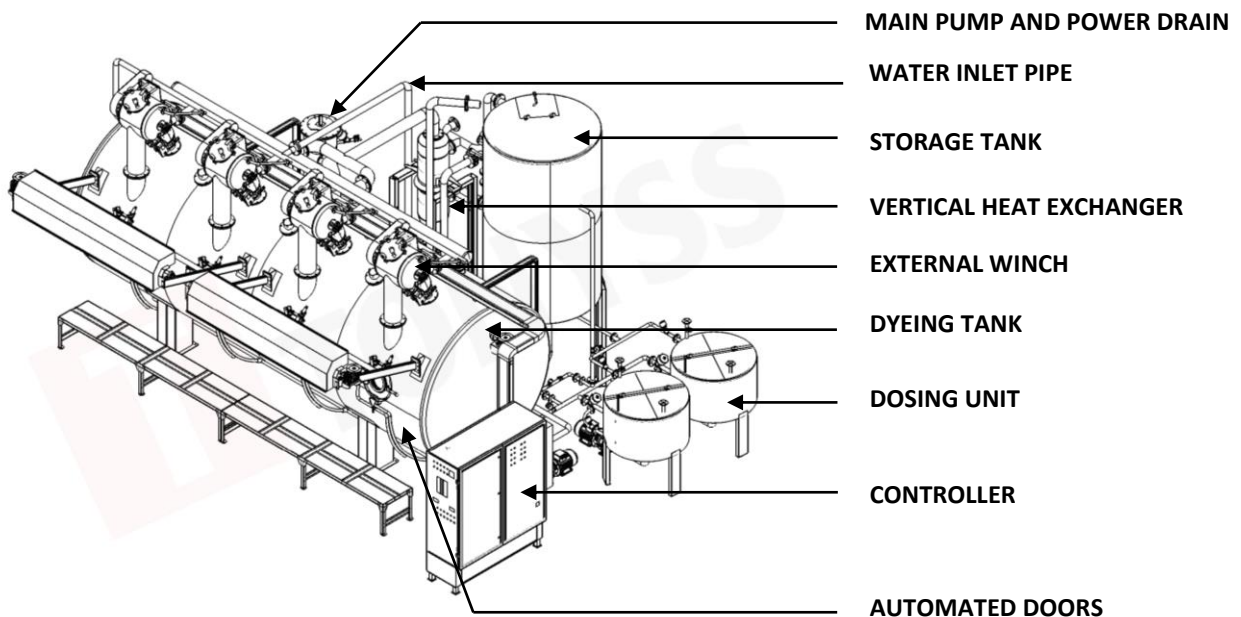
As we will see later on, in particular cases for some components and products, the R&D directly indicates a specific supplier to the Purchasing department.

The R&D and the Purchasing department work always independently, thus the latter has no possibility to contribute to the NPD process. Since the only contact point with external suppliers is the Purchasing department, also Supplier Involvement in NPD becomes almost impossible in the standard cases: supplier simply “makes to print”.

## 4. SUPPLIER INVOLVMENT IN NPD

### 4.1 NPD PROJECT

In order to understand how TONYSS deals with Innovation, we have analyzed the introduction of a new in the model Automated HTHP Softflow, which is low liquor ratio of 1: 4 compared to previous models.



HTHP Softflow is composed of 9 main parts:

- 5 casting components manufactured by TONYSS: the storage tank, the dyeing tank, the dosing unit and the winch.
- 4 components outsourced: the controller, the stator and the rotor, the shaft and minor components (Pipes, screws, bolts etc.).

Addition to this, a hydraulic door also developed by the company in order to avoid accidents, since these machines work under high pressure and high temperature.

## 4.2 TONY'S NEW SOLUTION

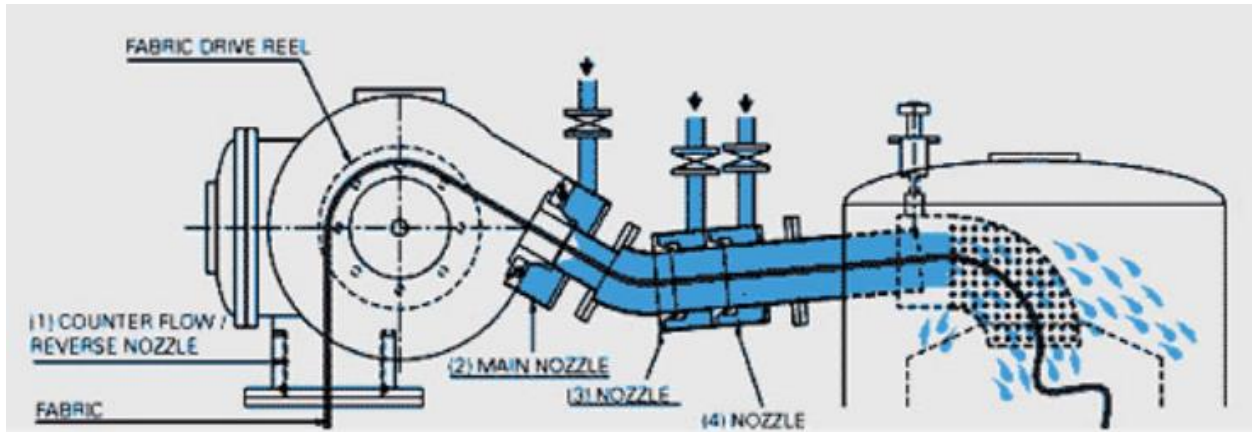


Figure 11: External Winch

In order to reduce the liquor ratio and the whole process cycle time, TONYSS developed a new winch and made significant improvements in the cycle time control function, in the new technical design, the main winch prevents grease marks and pilling problems by working minimum slippage and added extra mechanical seal to avoid leakage in the system. Addition to this, the height adjustable nozzles which is inside the external winch has flow control valve which can be adjustable manually in the new design. The height adjustable nozzle control is set manually in the controller system according to the flow pressure.

Over time the company got aligned with its competitors by this type of additions to the winch, which was effective but costly, since the system is very complex (need to control, winch reel speed, temperature, accurate dosing of chemicals, pressure and so on). This system allows to decrease the liquor ratio from the 1:10 to 1:6. Yet, the height adjustable nozzle is an additional component in the machine, and it needs to align the height always with the controller in-order to maintain the efficiency, it is added only as optional price and component on customers request.

*This was the reason why the R&D department was asked to find a way to make the new auto-adjustable nozzle, a standard component of the pump with a target cost equal to zero, so to differentiate TONYSS offer from its competitors.*

As a result of R&D work, the automated height adjustable nozzle was designed by the R&D team. So that, liquid ratio is adjusted automatically with respect to the flow pressure. Thanks to the Research & Development team where this new solution was eight months of hard work. The first step of the method consists of shifting problem to generic one, how to control the water waste from the system, simply focusing a way to company's vision that working towards zero discharge and making the eco-friendly



*Figure 12: Newly Developed Winch*

machine. Consequently, as a generic solution they came up with the idea called “Auto-Adjustable Nozzle” which can be adjusted automatically respect to its height. This result is efficient water management and also increase or decrease of flow pressure according to the type of fabric processed. At this point a problem has arisen aligning this system with controller became complex since controller is outsourced completely.

Thanks to effort of Research & Development Team, who were directed to the company's vision zero discharge, but this comes under a huge cost of around 100'000 INR (Indian Rupees) and also time where it took around eight months to develop this technology alone.



### 4.3 TIMING OF SUPPLIER INVOLVEMENT

From our analysis, it has emerged that in the first attempt (Auto-Adjustable Nozzle) the company involved SETEX only in the last phase of the product development process. Indeed, the supplier was asked only to adopt the controller component into the system aligned to the specifications of the R&D.

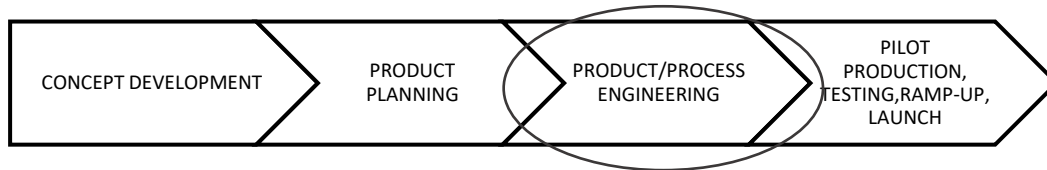


Figure 13: Auto-adjustable Nozzle Stage

In this case SETEX, the supplier acts like a White Box since it follows full technical specifications provided by customer, as all the other suppliers of the company generally do. The newly developed component (Auto-Adjustable Nozzle) was developed completely by TONYSS, so it became too complex for the supplier (SETEX) to adopt the controller component according to TONYSS specifications, as the new winch design is fully automated process, the new controller should align with the temperature, pressure, winch reel speed respect to the height adjusted.

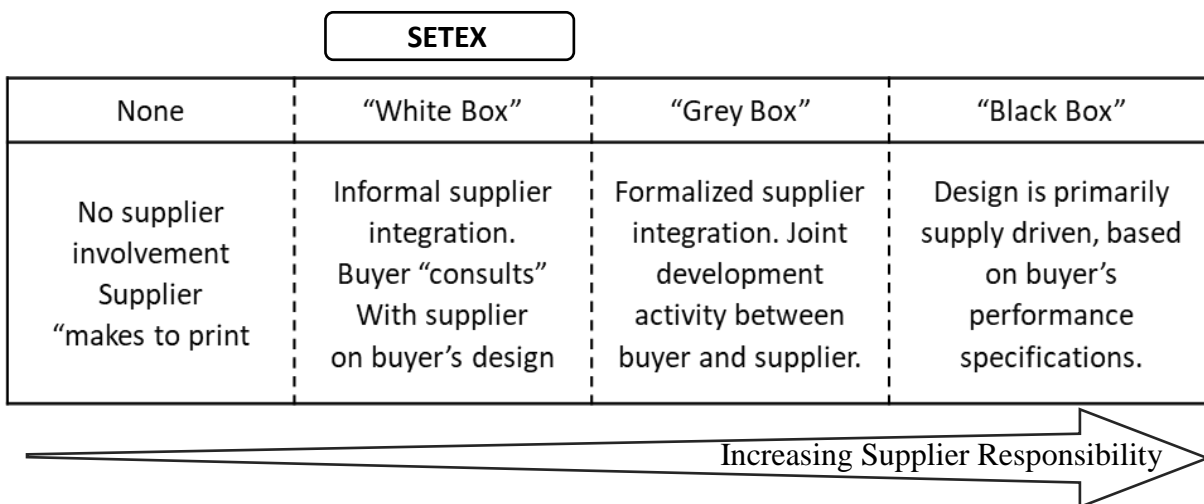


Figure 14: Supplier Responsibility

## 4.4 THE KRALJIC MATRIX

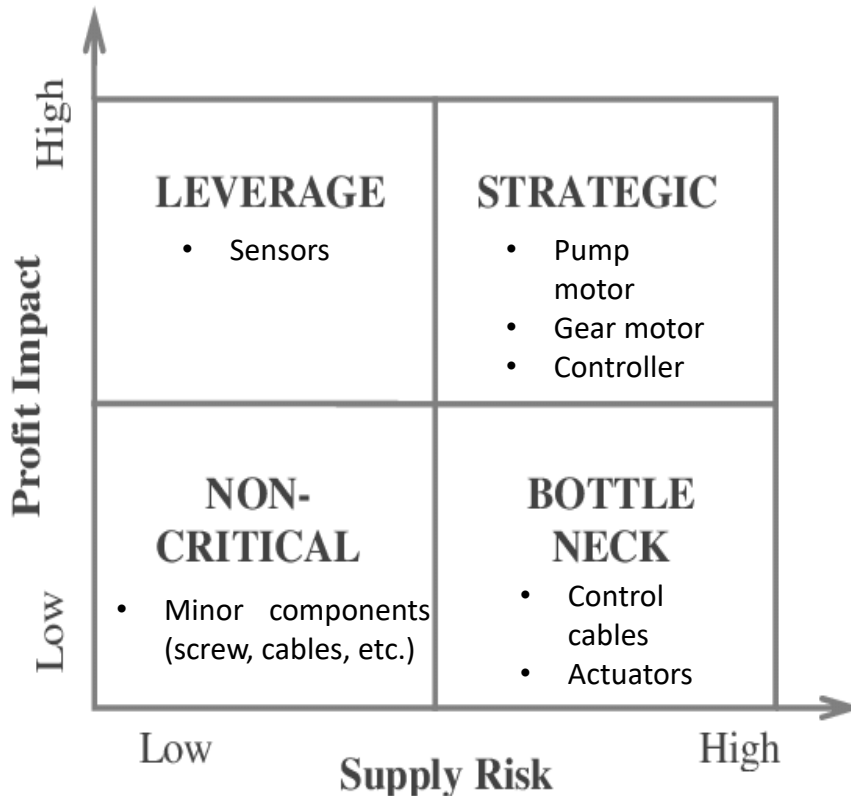


Figure 15: Kraljic Matrix

In order to better understand how TONYSS deals with suppliers we classified the several components of the new HTHP Softflow in the Kraljic Matrix.

How did we obtain this result?

We classified the outsourced components according to two dimensions:

- **The Importance of the Purchase:** It has been computed as the weighted averaged of the cost of the specific component and the value that it has with respect to the whole product. We have assigned a higher weight to the value since the costs are quite stable and do not constitute a potential source of competitive advantage in this market.
- **The Supply Risk:** It has been evaluated as the weighted average of the Specialized Know-How required by the suppliers to provide the component and the switching costs that TONYSS would face changing the supplier. They are both influent variables and so we assigned them a similar weight.

## 4.5 SOURCING STRATEGIES

On the basis of the results of the Kraljic, we have analyzed the different Sourcing Strategies adopted by the company for the purchased items.

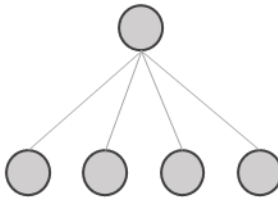
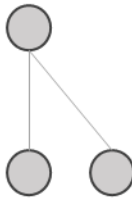

	<i><b>MULTI - SOURCING</b></i>	<i><b>PARALLEL- SOURCING</b></i>	<i><b>SINGLE - SOURCING</b></i>
			
<b>COMPONENTS</b>	<ul style="list-style-type: none"> <li>• NON CRITICAL ITEMS: MINOR COMPONENTS (screw, cables, etc.)</li> <li>• CABLES</li> </ul>	<ul style="list-style-type: none"> <li>• STORAGE TANKS</li> <li>• SENSORS</li> <li>• GEAR MOTORS</li> </ul>	<ul style="list-style-type: none"> <li>• CONTROLLER</li> </ul>

Figure 16: Sourcing Strategies

It is quite intuitive to understand why TONYSS adopts a Multi-Sourcing strategy for Minor Components. Indeed, Multi-Sourcing is the use of several suppliers for buying the same or very similar products and minor components are Non-Critical Items, as they are standard ones and so, generally, easily available in the market. Therefore, it is an appropriate strategy to spread the risk and to avoid the dependence on one supplier since the Company can easily switch from a supplier to another if necessary.

On the other hand, Strategic Components are the most relevant ones, because of the value they have, and the know-how required to produce it. Thus, the optimal strategy would be producing them internally, as it happens for the pump, the motor housing, controller housing and the storage tanks.

However, they require high competences to be developed so this is not always possible. As a consequence, TONYSS adopts a Parallel-Sourcing Strategy for this particular item, with the exception of the Controller. Parallel-Sourcing is a way to maintain competition between two suppliers that have similar capabilities and deliver the same type of components. It is also a way to ensure to have always a back-up in case there are problem with the preferred supplier. Indeed, TONYSS adopts lean manufacturing and it is crucial to avoid the risk of out of stocks.

The Controller is provided by SETEX, which is the only supplier. The Single-Sourcing strategy is due to the fact that SETEX knowledge for the NPD has been crucial and, moreover, since it is a German designed controller, there are no problem for the reliability and the service support.

## 5. SUPPLIER INVOLVEMENT & RELATIONSHIPS

### 5.1 AUDIT ANALYSIS

The company filled an audit about Supplier Involvement in Product development (in the Appendix A). There are many x-starred which refer to the SETEX case and some other current NPD projects.

By analyzing the Audit results, we came up with several conclusions:

- The company has clear criteria to choose and evaluate suppliers, but they may need to analyze if those criteria are coherent with their corporate strategy: the company main goals are quality and sustainability, but it emerges that TONYSS overlooks the importance of controlling them along the whole supply chain.
- There is an increasing trend towards a higher level of Supplier Involvement, but they do not push towards committing and installing an actual relationship with suppliers. By sharing risk and proper training, they could increase commitment lowering communication barriers that now are a problem for the implementation of ESI in the short-term. Nowadays, TONYSS is focused on ensuring contractual compliance, which is an indicator of a low level of trust and thus of relationship maturity.
- TONYSS keeps the knowledge internally and is reluctant to share information with suppliers. This is an indicator of an unbalanced power. By analyzing their internal organization, it has emerged that the information sharing is limited even within the company itself, where the business units are well defined and separated. A higher level of integration in the company may increase commitment with suppliers as well.
- It emerges the tendency of the company to innovate the product internally without cooperating with any other, even though the Auto-adjustable nozzle was a clear demonstration of the advantages of a R&D development. Indeed, supplier involvement in NPD came unexpected but, through this experience, the Company is raising awareness about the possibility of gaining from it. Long-term effects would be know-how sharing, higher investments on R&D by the supplier and helping each other when facing problems.

## 6. IMPROVEMENTS AND CONCLUSIONS

The aim of the literature review was to understand how a company identify, evaluate and select suppliers in NPD process at an early stage. In the case of the SETEX, who is the sole supplier for the controller component, we see that if the SETEX had been involved in an earlier stage it could have been possible to avoid the R&D development cost and time since the development of Auto-adjustable nozzle took around 8 months and also costed about 100,000 (Indian Rupees). Therefore, we believe that involving supplier earlier could lead to further improvements in terms of costs and time, avoiding re-iteration in the NPD process. Obviously, the implementation of ESI is a long-term objective since it would entail a change of culture in the organization.

In the case of New Product Development, we found that the company spent lot of time and money in R&D, and also, we noticed that the company placed all the suppliers in white box. So, for the long run, we suggested the company to move some of the strategic suppliers from white box to grey box so this will increase the innovation capability of the company and reduce the time to market. In the case of Auto-adjustable nozzle, the company solely developed the design by spending lot of time and money but when came to integration with controller and other parts it became time consuming and complex project for the suppliers as they need to adopt the design which will become less complicated when suppliers are involved in planning stage.

Additionally, from our analysis it has emerged that the Purchasing Department has no technical competencies. Therefore, dealing with technical issues is a full responsibility of the Engineering department/R&D.

*“Having engineers in purchasing is critical because they are responsible for translating the technical requirements into a voice for the supplier”*

For this reason, we believe in the need of inserting engineers in the Purchasing Office to exploit innovative ideas that may emerge when dealing with suppliers. So, a pair of well-trained eyes on the product development may be the key to see these opportunities.

## **7. METHODOLOGY**

Our study begins with a broad literature review in order to answer the research questions and to better understand the different aspects of early supplier involvement in New Product Development, its benefits, limitations etc. Later on, study about the company and its structure, in-depth analysis of the purchase and the supply chain process and understand how the company is choosing its suppliers and involving suppliers in the new product development. Using the tools and theories based on the study, brainstorm ideas and provide suggestion to improve the selection of supplier and how to involve supplier in the new product development.

In order to perform our analysis, we mainly referred to Primary Data, collected through interviews to the R&D project manager. Thanks to his collaboration, we collected all the documents and the information needed for the project.

We used also Secondary Data to better understand the context in which the Company operates and its background. For this purpose, TONYSS website has been a useful source of information.

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# APPENDIX A

## Supplier Involvement in Product Development: An Audit Instrument

	Yes	Don't Know/ Neutral	No
We formally analyse the need for supplier involvement across part/component groups	<input checked="" type="checkbox"/>		
We use a strategic framework for this analysis, assessing issues such as technological risks and supplier capabilities relative to our capabilities	<input checked="" type="checkbox"/>		
We are confident that the framework we use for this analysis is appropriate for our business		<input checked="" type="checkbox"/>	
We explicitly identify different supplier roles and their different levels of involvement in projects e.g. black, grey and white box	<input checked="" type="checkbox"/>		
We communicate and agree these roles and expectations to the suppliers and our own internal departments	<input checked="" type="checkbox"/>		
We involve strategic suppliers in the concept development stage or at least early design stage	<input checked="" type="checkbox"/>		
We issue functional or global specifications to strategic/black box suppliers and ask them for solutions to problems	<input checked="" type="checkbox"/>		
We select and evaluate strategic suppliers based on their innovative capabilities	<input checked="" type="checkbox"/>		
We obtain full motivation and commitment by strategic suppliers			<input checked="" type="checkbox"/>
We mutually agree risk & benefit sharing arrangements with suppliers			<input checked="" type="checkbox"/>
We clearly communicate our policies, specifications and performance requirements to suppliers?	<input checked="" type="checkbox"/>		
We listen to the strategic suppliers' feedback and suggestions regarding above		<input checked="" type="checkbox"/>	
We have shared training with key supplier personnel			
We do our best to ensure that relevant information reaches sub-suppliers	<input checked="" type="checkbox"/>		
We take part in visiting suppliers that need to collaborate amongst themselves			<input checked="" type="checkbox"/>
We have arrangements for resident engineers/designers with strategic suppliers			<input checked="" type="checkbox"/>
We ensure that strategic suppliers agree with performance targets			
We adopt a root cause analysis approach to problem solving instead of blaming suppliers when things go wrong	<input checked="" type="checkbox"/>		
Our top management is committed to and supports our supplier partnerships	<input checked="" type="checkbox"/>		
Several internal functions are involved in supplier partnerships and these all collaborate to ensure their success		<input checked="" type="checkbox"/>	
We have conducted a core competence and/or a technology audit to decide which competences/technologies to maintain in-house, which to out-source, which to in-source/develop internally	<input checked="" type="checkbox"/>		
We have formulated and exchanged our policies for supplier involvement e.g. IPR agreements	<input checked="" type="checkbox"/>		
We continuously search supply markets for new technological innovations	<input checked="" type="checkbox"/>		
We pre-select suppliers for forthcoming product development projects	<input checked="" type="checkbox"/>		
We exchange technology road maps with strategic suppliers			
We involve suppliers in technology development/R&D programmes		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<b>Result:</b>	Leading Edge/ESI Practices	ES Practises Inev. Ignition	ES Holding Back Organisation

10.08.2019

Dev. Policy

## APPENDIX B

### VENDOR RATING

Vendor rating in TONYSS is made by a weighted point plan, by which suppliers are given a rating in relation to the attainment of some weighted level of performance. The Purchasing department submits suppliers to a questionnaire that has the purpose of evaluating the organizational system and the ability of the supplier to operate with quality criteria to ensure product conformity to the requirements and technical specifications over time.

This evaluation is based on the classification and subdivision of products into the **Functional Class (CF)**:

- CF1: critical;
- CF2: important;
- CF3: secondary.

The Supplier is evaluated on the basis of the responses provided, which are assigned points depending on whether the activity to be verified / is not carried out and / is not documented.

The total score obtained allows to establish the **Percentage of Global Coverage**, therefore, to classify suppliers as “qualified” for a functional class (or also for different products in different class) or “non-qualified”. Current supply base's position is reviewed every 6-12 months depending on the quality of the product provided, confirming whether or not the merit class. Also new Supplier are evaluated according to this framework, in order to become or not approved suppliers.

The output of this evaluation is also an improvement plan in which TONYSS identifies the aspects of possible improvement and communicates them to the supplier who is committed to implementing within a certain date.