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# Impact of the decoupling point (DP) on the performance of aeronautic companies: Case of the Moroccan aeronautic industry

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**Abstract**
Faced with the global context, companies are called upon not only to become "lean", favoring the total quality approach and the development of a value chain based on the elimination of any kind of waste or loss, but above all to be also "agile" with an emphasis on perfect market knowledge and the judicious use of the notion of a virtual company to exploit the opportunities that arise in a volatile market. To do this, the postponement strategy approach is one of the innovative and efficient solutions enabling firms to better adapt to the new economic requirements thanks to the combination of these two complementary concepts as well as the positioning of the decoupling point. A quantitative study on the applicability of this approach will be carried out on a sample of 42 Moroccan aeronautical companies.

**Keywords:** organizational legality, postponement strategy, decoupling point, aeronautic companies

## 1. Introduction
When companies focus their intentions on the end-user, many parameters have to be taken into account. These parameters can be summarized into four essential elements, which present to the end user the total value of a product, namely: service, quality, cost and delivery time (FIG.1) (Johansson, McHugh, Pendlebury, & Wheeler, 1993) [11]. To meet market needs, the combination of these four factors can arise in a variety of ways, including a high level of service, quality required, reduced costs and shorter lead times.

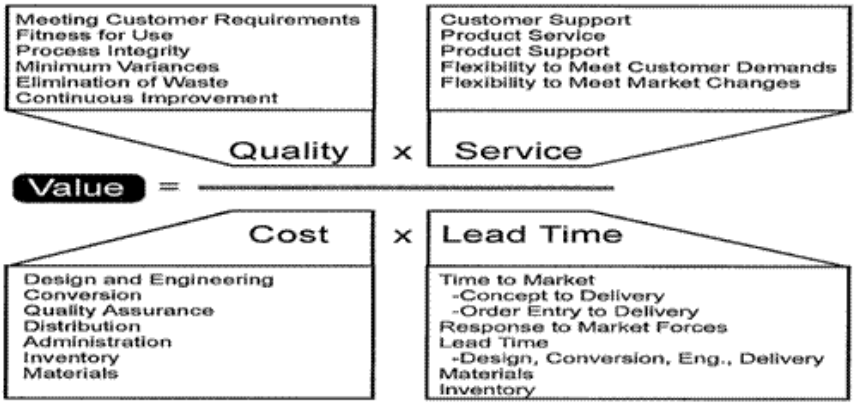



**Fig 1:** Total value metric (Johansson *et al*, 1993) [11].

If companies won more orders by providing better service, the following year they could continue providing this level of service to position themselves in the market using the key features of both agile and lean concepts (Hill, 1993). Hence the importance of integrating two other parameters, flexibility and responsiveness, and retain five parameters for these companies become more efficient in terms of optimizing logistics flows: cost, delay, quality, flexibility and responsiveness (Moussaid, Aggour, & Abou El Hassan, 2017, p. 130) [14]. Thus, companies are called upon to master the notions of the decoupling point as well as the strategy of the transfer to be both lean and agile.

## 2. The Decoupling Point (DP) and the report strategy
### 2.1 Definition
The DP is the stage of the production process where the customer's order takes over from the forecast. Until this point, the supply and / or manufacture are carried out in order to build up a stock. After this point, the command can be fulfilled within a relatively short time. The DP has to indicate equally the manner and form in which the stocks are held. Thus, in example FIG. 2, at the level of the upper diagram, the demand can reach up to the time of manufacture and the storage can thus be either in the form of components or in the form of materials. On the other side, in the lower part of the same example, the demand is only visible at the end of the chain. Thus the storage will consist of finished products. The goal of the agile supply chain is to have a stock in a generic form - namely standard semi-finished products awaiting final assembly called report strategy or postponement, a vital element of any agile strategy.

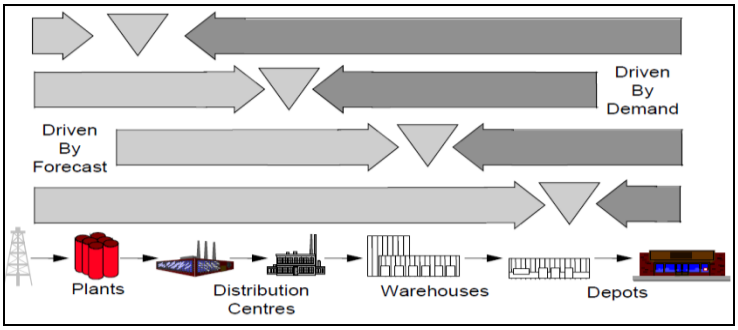



**Fig 2:** The notion of strategic storage at DP (Hoek, & Remko, 1998) [8].

The notion of postponed or delayed configuration, is based on the principle of researching the design of products using common platforms, components or modules, in the final assembly phase i.e. the customization of the products is done only after the integration of the requirements of the final market. The recognition of this point is essential during the examination to define the concept to be adopted namely lean or agile manufacturing techniques. Thus, the report strategy is the result of an association of these two techniques with the positioning of the DP. The objective of the report strategy is to increase the efficiency of the supply chain by shifting product differentiation closer to the end user. The postponed DP reduces considerably both the risk of being out of stock and the unnecessary storage time.

Advantages of the report strategy are several (Hoek, & Remko, 1998) [8]. Firstly, storage can be held at a generic level so that only a small amount of different components is maintained and thus fewer stocks as a whole. Secondly, thanks to the generic stock, the flexibility is greater, which means that the same components, modules or platforms can be incorporated into a variety of finished products. Third, the concept of forecasts is more controlled at the generic level than at the level of the finished product. This last point is particularly important in global markets where forecasts are less accurate.

### 2.2 The DP and the classification of supply chain structures

The challenge of Supply Chain Management (SCM) is to look for applying lean system strategies to make the DP. However, with the strategies of the agile system the objectives go far beyond this point. In other words, while using the generic or modular stock to have the finalization of the products until the end of the process; it is possible to achieve volume-based economies of scale through standardization of products. The flow of products may well be based on forecasts up to the DP. After this DP, it must be determined by the real demand.

Furthermore, there are two decoupling points. The first is related to the physical flow. This is a point where strategic stocks of decoupling are maintained in as generic a form as possible. This point should ideally be located as far downstream as possible from the supply chain and as close as possible to the final market. The second is related to the flow of information. This involves uploading information as far upstream as possible in the supply chain. In other words, we are talking about the penetration of final real demand. Mason Rachel, Naim, & Towill (1997) [13] demonstrated the importance and the positive role that information feedback can have on reducing both the upstream amplification and the deformation of customer requests.

Thanks to the management of these two decoupling points, the company benefits from both an increase in the response rate of customer requests by improving its responsiveness and a considerable reduction in the undesirable effect of the increase in demand variability, also known as «Bullwhip effect» (Forrester, 1961; Hau, Padmanabhan & Whang, 1997) [4, 6]. Billington & Amaral (1999) [1] suggested that the combination of information sharing in the supply chain and the delayed configuration through the report strategy can dramatically improve responsiveness. However, the delayed configuration can have a much greater effect than the effect created by the sharing of information (Sringesh, & Tayur, 1997) [17].

This section discusses the relationship between the structure of the supply chain and the point (when and where) to adopt the lean or agile system. First, some simplified structures with the DP will be presented in different positions along the supply chain. Then, a more refined explanation for their uses with the two concepts: lean and agile.

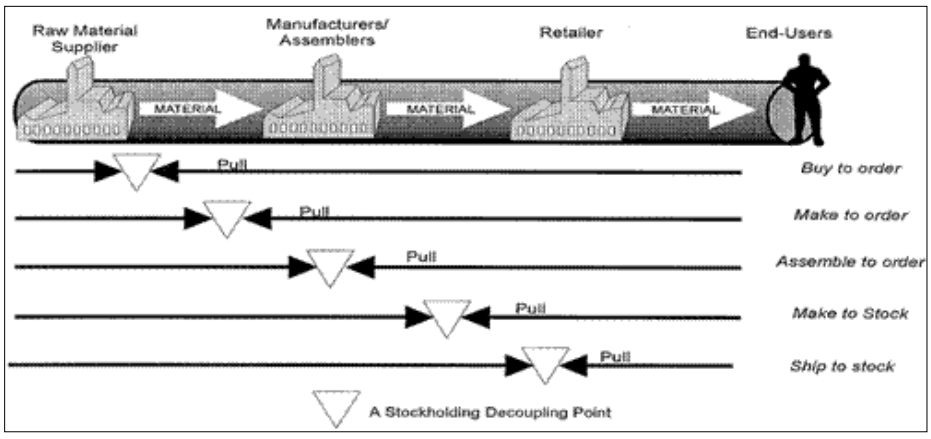



**Fig 3:** The Supply chain strategies (Hoekstra, Romme & Argelo, 1992)

FIG. 3 presents the family of simplified supply chain structures combined with the DP marked as a point of held stocks (Hoekstra *et al*., 1992). In the supply chain, we note on the one hand that companies can take the form of producers and / or assemblers, and on the other hand we note the existence downstream of another storage point in terms of physical flow due to the change in the process of a batch process from the raw material suppliers to a flow per piece.

The DP thus separates the part of the supply chain that responds directly to the customer from that part of the supply chain used in the planning phase, and a strategic stock helps to cope with the variability in the demand for the supply chain. The positioning of the DP depends on the delivery time that the end user is willing to tolerate and the moment when the variability of the demand for the products is dominant (Hoekstra *et al*., 1992; Lehtonen, HolmstroKm, & Slotte, 1996). Downstream is defined from the DP, all products are drawn by the end user, called « market driven ». Upstream is defined from the point of decoupling of the supply chain which is based initially on the forecasts, called « forecast driven » (Olhager, 2010).

Thus, the variation of the position of the DP in FIG. 3 shows five classes of distinctive supply chains and the DP can be located at five different times over the entire cumulative time period depending on the type of production and distribution, from the delivery on stock of finished products to the purchase and manufacture to order (Fig. 3).

1. The Buy-to-Order Supply Chain concerns single products which do not necessarily contain the same raw materials. The end user is willing to accept a relatively long delivery time with a very variable demand for products. Thus, stocks held in the supply chain have a high risk of obsolescence. Indeed, if these companies have failed to sell their particular products in the market, the supply chain finds itself with additional costs of over-storage. Thus, the supply chain would not be able to exploit quickly the opportunities presented by the new markets, such as the case of the second supply chain.
2. The Make-to-Order Supply Chain is capable of taking different forms of products despite being made from the same raw materials. This second category has equally to face a variety of locations, product ranges and multiple volumes. The delivery time will be reduced, but end users still have to accept a long waiting time to get the product they want. The demand for the product can be variable with a high level of customization both in terms of the number of different combinations possible and the quantities of basic models needed to be transformed and adapted. This supply chain is then at the risk of large inventories of components and raw materials.
3. The Assemble-to-Order Supply Chain recommends that the customization of the order to be postponed until the furthest point possible in the supply chain with a DP which moves inwards towards the producers and / or assemblers. Through this strategy, the supply chain is able to respond to a range of varied products. The delivery time will be considerably reduced but depends on where the final assembly took place in the supply chain. This slightly increases the risk of over-storage or under-storage. However, the supply chain is protected against the risks of obsolescence and it will be in a better position to take advantage of the growth benefits of a product during its life cycle. It will also be able to cope with the different needs and different places.
4. The last two (Make-to-Stock) & (Ship-to-Stock) supply chains meet to a range of standard products. The Make-to-Stock strategy means that the supply chain can cope with demands in a variety of locations, but calls for a constant global demand for a standard product. The Ship-to-Stock strategy provides a standard product in fixed locations. Supply chain managers must be able to accurately predict demand if they adopt these two strategies. However, we should be aware that forecasts are more accurate at a reasonable level of inventories in order to minimize the risk of out-of-stock and over-stocks (Fisher, Hamond, & Obermeyer, 1994, pp. 83-93) [2].

## 3. The DP between rationality and agility

### 3.1 Relationship between the DP and the Lean-Agile-Legality triptych

In some circumstances, the application of one of the two agile or lean strategies will be most appropriate for such a supply chain. Indeed, the lean concept is intended for standard and predictable products with a limited and predetermined range but with a high volume of demand. The aim is to act on performance in terms of costs by reducing or eliminating any type of waste or loss. The DP or Costumer Order Decoupling Point (CODP) would, in this case, be placed after the production and the constitution of the stock, for a possible delivery to the customer (pushed flows); which corresponds to the two latter Supply chains Make-to-Stock and Ship-to-Stock types. On the other hand, the "agile" concept is adopted in the case of markets characterized by specific orders and / or demands and products with a wide range but low volume. This concept is chosen to better respond to changes (unpredictable or unexpected) of the customer with a certain flexibility and responsiveness and act on the performance of enterprises in terms of time and differentiation, because if the supply chain held stocks they could become obsolete and therefore the decoupling point CODP is presented upstream, upon receipt of the customer's order (pulled flows). This meets to the second of supply chain Make-to-Order type.

Otherwise, there are often situations where a combination of these two concepts is the most appropriate called a "Legality" hybrid strategy. It consists of adapting the product to the requirements of the customer, i.e. having, at the same time, a stock, but, which could easily be transformed into a product responding to the final choice of each customer. This corresponds to the third supply chain Assemble-to-Order type. At the level of the hybrid supply chain strategy, there is a mixed portfolio of products and markets. Some products are characterized by stable and predictable demand and other products where the opposite is true. Thus, the characteristics of demand must be raised in the design of supply chains (Fisher, & Marshall, 1997) [3]. However, the major problem in most supply chains is the limited visibility of real demand. As a precautionary principle, supply chains tend to end up with several levels of stocks between production and final markets, they are based on forecasts rather than real demands.

### 3.2 The effects of variety and variability on the DP

The effect of the DP is summarized in FIG.4. This shows the relationship between the DP and the level of the variety of products as well as the variability of demand. At the

downstream side of the DP, the demand is so variable with a great variety of products. Whereas in the decoupling upstream point, the demand is smooth with less varieties. This means that the point of differentiation of the products is found in the downstream of the DP, and the stocks are held at the DP level acting as a buffer between the variable demand and the production planning level.

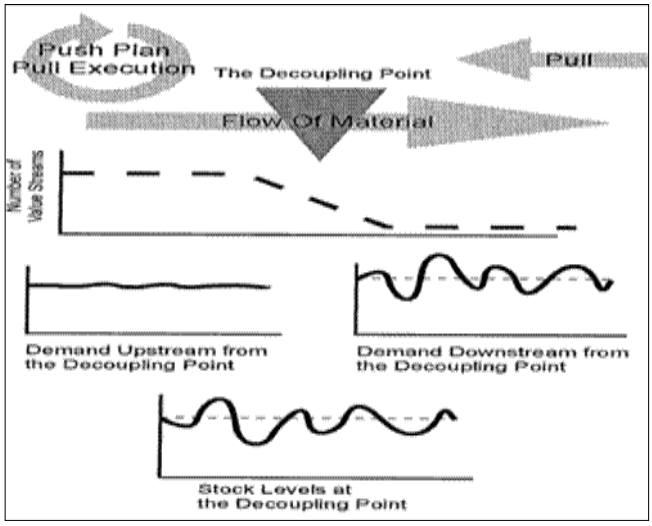



**Fig 4:** The effects of variety and variability on the DP

### 3.3 Impact of lean-agile concepts on behavior of dependence and fluctuation effects

In a given operating system, there are usually dependency and fluctuation phenomena (Goldratt, 1990) [5]. When these phenomena are found together in a delivery system, they define the basic characteristics of the workflow, which gives us an idea of the methods and levels of the supply chain. The example shown in FIG. 5 designates a simple delivery system with five dependent resources for the material processing. Suppose there are variations in the system due to various factors, such as machine failure, process adjustment, quality issues, delays in implementation, etc. If we now consider the existence of these fluctuations, the disturbance not only directly affects the event in question, but worse, there will be also a knock-on effect [1] on the Dependency line. The traditional means used to overcome this kind of problem lies in placing a sufficient stock between each process thus allowing an efficient decoupling of the impact of the fluctuations, as shown in FIG. 5.

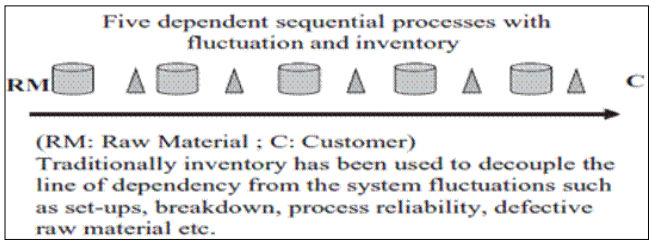
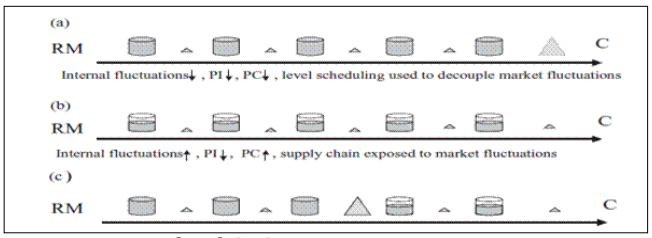



**Fig 5:** Example of dependencies and fluctuations Phenomena

[1] Knock-on effect: The accelerating effect refers in the economy to the reciprocal effect of the growth of demand and that of productive investment. The accelerating effect and the multiplier effect are the two main effects that in macroeconomic models link investment and consumption.

Storage functions such as cycle, decoupling, buffer stock, etc. act directly on system fluctuations and, in combination, on the effects of amplification of the supply chain. An alternative to investing in stocks to protect the flow under these conditions is to invest in additional capacity. This option is not solicited for mass production, but the excess capacity on most resources is an implicit feature of functional batch and cell production. The use of so-called protection capacity, in place of the concept of the security stock, allows more flow fluidity and also sets the standard for the service companies where people form, in a different way, the "stock queues".

After introducing the nature of interaction of dependence, fluctuation, capacity and the notion of stocks, we proceed to the behavior of the lean and agile strategies towards these parameters. Indeed, with the introduction of lean manufacturing, surplus stocks are rapidly reduced to the point where the remaining stock levels act to smooth the effect of different sources of fluctuation. As the level of the stock is gradually reduced by "forced problem solving", system fluctuations in the form of process variation, set-up delays, and plant reliability, etc., are identified as a type of waste to be eliminated.




RM: Raw Material and C: Customers

**Fig 6:** lean, agile and leagile Supply taking into account dependency, Fluctuation, protective capacity (PC) and protection inventory (PI). (a) The lean offer, (b) the agile offer and (c) the Leagile offer. The decoupling point separates the lean system and agile operation.

In this way, the reduction of inventories makes it possible to eliminate the sources of fluctuation as well as all activities considered as waste that follow along the supply chain. This is necessary to avoid the impact of the change in demand on the supply chain. FIG. 6a illustrates the lean operating system with low levels of variation and internal stock.

However, the company uses high levels of inventories to decouple the production system from changes in market demand, such as the practice of planning level. Accumulation of spare parts inventories in the final state is common in the automotive industry which uses mass production where market demand for a standard product is relatively stable and the stock is not sensitive to obsolescence.

In the case of agile supply (FIG. 6b), there are two major differences. On the one hand, the non-standard nature of the product intrinsically leads to high levels of internal fluctuation on the other hand; the unstable nature of market demand prevents the efficient use of the final inventories in order to decouple the logistics system. FIG. 6b, focusing on the role of protective capacity, often takes the form of the purchasing function and gives priority to capacity rather than purchasing specific products or components from suppliers.

The use of common components, or modules, often delays the product differentiation level and FIG. 6c is more representative, with a decoupling of the inventories making it possible to smooth the flow upstream supply and increasing the capacity of the final configuration. Moreover, the use of capacity to allow a fluid flow, instead of the inventories, is an important of the distinction between lean and agile paradigms and trade-off [2] between low-cost production and reactive production. What generates a choice between an investment in capacity or benefit the inventory with associated risks. This simple but explicit means of conceptualizing lean and agile supplies presents distinctions rather than a continuum, that even lean operations must manage variation and the JIT concept "under capacity scheduling" uses the ability to protect flows. After establishing the nature of the trade-off, it is necessary to develop its role in design before using it in the creative development of hybrid systems.

## 4. Behavior of companies towards DP: cases of the aeronautics industry in morocco

### 4.1 Epistemological Orientation and Research Methodology / Assumptions

The implication of a positivist approach in the field of research results in an objective interrogation of the facts leading to the empirical confrontation of the hypotheses previously formulated (Poesi, & Maréchal, 2003, p. 50) [16]. Thus, our approach fits in with this perspective and thus positions our empirical research in positivist logic. On the basis of the propositions put forward by the theoretical analysis, empirical study is based on a hypothetico-deductive approach. The objective of this approach is to infer explanations for the phenomena observed from the initial assumptions. It is about "verifying, predicting and mastering" (Igalens, & Roussel, 1998, p. 207) [10].

The paper involves two assumptions: a null assumption H0 an alternative assumption H1. H0: The lack of control over the application of the DP has no effect on the performance of Moroccan aeronautic "Legality" companies and H1: Moroccan aeronautics companies of the "Legality" type, which successfully master the application of the DP, succeed in improving their performance.

### 4.2 Descriptive analysis and hypothesis testing

In this paragraph, we will describe the set of data relating to the aeronautic companies questioned. We wanted to study the characteristics of the data collected by the survey. Thus we will explain the specificities of the companies in the sample.

On a sample of 42 aeronautic companies based in Morocco, the distribution, according to the legal status, the Limited Liability Companies (LLC) present about half (47,6%, that is to say 20 companies). The second half is shared equally between the Anonymous Companies (AC) and the Multinational Enterprise Subsidiary (MES) (26,2%, that is to say 11 companies for each). Regarding the sizes of companies, we firstly find Small and Medium Enterprises (SMEs) (81%, that is to say 34 companies, whose 42,9% Medium Enterprises (ME) and 38,1% Small Enterprises (PE)) Followed by Large Enterprises (LE) (14,3%, that is to say 6 companies) and lastly Very Small Enterprises (VSE) (4,8%, that is to say 2 companies) (Table 1).

**Table 1:** Legal status crossed by effective

| | | What is the size of your company? | | | | Total |
|---|---|---|---|---|---|---|
| | | SME (1 to 9) | SE (10 to 49) | ME (50 to 249) | LE (250 and more) | |
| MES | **Effective** | **0** | **2** | **6** | **3** | **11** |
| | % of total | 0,0% | 4,8% | 14,3% | 7,1% | 26,2% |
| LCC | Effective | 2 | 13 | 5 | 0 | 20 |
| | % of total | 4,8% | 31,0% | 11,9% | 0,0% | 47,6% |
| AC | Effective | 0 | 1 | 7 | 3 | 11 |
| | % of total | 0,0% | 2,4% | 16,7% | 7,1% | 26,2% |
| Total | Effective | 2 | 16 | 18 | 6 | 42 |
| | % of total | 4,8% | 38,1% | 42,9% | 14,3% | 100,0% |

Initially, there are 42 Moroccan Aeronautic Companies (MAC). Ward's hierarchical classification analysis is performed on the five components (factors) derived from the Principal Component Analysis (PCA) and uncorrelated to each other. Thus, we obtain three groups of classification A, B and C relatively homogeneous:

- **Group A:** 13/42 aeronautic companies apply the Legality concept tools.
- **Group B:** 20/42 aeronautic companies are in the process of applying the Legality tools.
- **Group C**: 09/42 aeronautic companies do not apply the Legality concept tools. (Moussaid *et al*., 2017, p. 133) [14].

Concerning the study of the relationship between the three groups A, B and C resulting from the practicability of the Legality concept and the customization of the products (or assembly) that takes place either after the integration of the requirements of the final market either on the basis of forecasts, this study showed that type A MAC (i.e. apply perfectly the Legality concept) take into account the requirements of the final market in the customization of their products with a rate of 85% Versus 22% for type C companies (ie do not apply or misapply the Legality concept). On the other hand, half of type B MAC (i.e. partially apply the Legality concept) take account of the requirements of the final market in customizing their products with a rate of 50% (Table 2). This bi-varied study between the application of the Legality concept and the integration of customization of products in accordance with the requirements of the final market has proved a significant relationship (probability: 0,013 < 0,05). This relationship is considered Medium (V de Cramer = 0,455 < 70%) (Table 3).

[2] In a general way trade-off means compromise. In management and economics, it is defined by arbitration, designating the procedure, the decision to seek the best compromise between contradictory and mutually exclusive objectives.

**Table 2:** Classification group crossed by product customization

| The customization of the products (or assembly) is done after the integration of the requirements of the final market or on the basis of forecast? | | Yes, customization of products takes into account the requirements of the final market | No, Customization of products is done on the basis of forecasts | Total |
|---|---|---|---|---|
| Classification Group? | (A) | 11 | 2 | 13 |
| | (B) | 10 | 10 | 20 |
| | (C) | 2 | 7 | 9 |
| Total | | 23 | 19 | 42 |

**Table 3**: CHI-Square tests symmetric measurements

| | | Value | Approximate Meaning |
|---|---|---|---|
| Nominal by Nominal | Phi | ,455 | ,013 |
| | V de Cramer | ,455 | ,013 |
| N of valid observations | | 42 | |

According to the classification of the supply chain types (Table 4) and to the study of the structures adopted by the three types of MAC, we observe that:

- For Buy-to-Order supply chain type: purchase of raw material after receipt of sales orders: No company of type A or C practices this type of supply chains and only 10% (2/20) of the MAC type B (i.e. partially apply the Legality concept) that practice this type of supply chains.
- As for the Make-to-Order supply chains type: Manufacturing is launched after receipt of customer orders, there are 38% (5/13) of the MAC type A, 55% (11/20) of the MAC type B and 50% (4/8) of the MAC type C which apply this type of supply chains.
- Regarding the Assemble-to-Order supply chains type: Assembly is carried out after receipt of the sales orders. It should be noted that 54% (7/13) of the MAC type A, 30% (6/20) of the MAC type B and 25% (2/8) of the MAC type C which apply this type of supply chains.
- Make-to-stock: Manufacturing is launched on the basis of forecasts and delivery to various locations, 23% (3/13) of the MAC type A, 20% (4/20) of the MAC type B which apply this type of supply chains and none Type C company applies this type of supply chain.
- And finally, ship-to-stock: manufacturing is launched on the basis of forecasts and delivery to a single destination, 10% (2/20) of the MAC type B, 37% (3/8) of the MAC type C which apply this type of supply chains and none Type A company applies this type of supply chain.

**Table 4:** Classification of supply chain types crossed by classification group.

| Supply Chain Types | | Buy-to-Order: RM After orders | | Make-to-Order: Manufacturing After orders | | Assemble-to-Order: Assembly After orders | | Make-to-stock: Manufacturing launched on the basis of forecasts and delivery to various locations | | Ship-to-stock: Manufacturing launched on the basis of forecasts and delivery to a single destination | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | yes | no | yes | no | yes | no | Yes | no | yes | no | |
| Classification Group? | (A) | $0_a$ | $13_a$ | $5_a$ | $8_a$ | $7_a$ | $6_a$ | $3_a$ | $10_a$ | $0_a$ | $13_a$ | 13 |
| | (B) | $2_a$ | $18_a$ | $11_a$ | $9_a$ | $6_a$ | $14_a$ | $4_a$ | $16_a$ | $2_a$ | $18_a$ | 20 |
| | (C) | $0_a$ | $8_a$ | $4_a$ | $4_a$ | $2_a$ | $6_a$ | $0_a$ | $8_a$ | $3_a$ | $5_b$ | 8 |
| Total | | 2 | 39 | 20 | 21 | 15 | 26 | 7 | 34 | 5 | 36 | 41 |

Moreover, according to this study, the "Make-to-Order" supply chain is more commonly used by all MAC for all types (A, B and C) (20 companies), followed by the "Assemble-to-Order" supply chain with (15 companies) (table 6). This shows that these companies tend to integrate agility and Legality into their supply chains. Otherwise, Out of 39 responses, 27 MAC adopt a pushed strategy in their production systems of which 20 companies use Make-to-Order to start production after receipt of sales orders versus 12 MAC that use a pulled strategy to plan their productions of which 07 companies use "Make-to-stock" and 05 companies use "Ship-to-stock" to start production on the basis of forecasts and to deliver to various places (Tables 5 & 7).

**Table 5:** Type of strategy crossed by classification group

| Does your company put strategies to balance production planning in terms of a pulled or pushed strategy? | | Yes (pulled strategy) | No (pushed strategy) | Total |
|---|---|---|---|---|
| Classification Group? | (A) | 10 | 3 | 13 |
| | (B) | 9 | 9 | 18 |
| | (C) | 8 | 0 | 8 |
| Total | | 27 | 12 | 39 |

**Table 6:** Type of strategy crossed by classification group

| | | Value | Approximate Meaning |
|---|---|---|---|
| Nominal by Nominal | Phi | ,425 | ,030 |
| | V de Cramer | ,425 | ,030 |
| N of valid observations | | 39 | |

**Table 7:** Type of production crossed by classification group

| What is the closest in terms of manufacturing "make to order" or "make to stock"? | | Make-to-Order : Manufacturing is launched after receipt of sales orders | Make-to-stock: Manufacturing is launched on the basis of forecasts and delivery to various locations | No options | Total |
|---|---|---|---|---|---|
| Classification Group? | (A) | 7 | 2 | 1 | 10 |
| | (B) | 8 | 1 | 5 | 14 |
| | (C) | 5 | 2 | 1 | 8 |
| Total | | 20 | 5 | 7 | 32 |

The following tables 8 and 9 confirm the orientation of these companies. So:

- Concerning the 07 Moroccan aeronautic companies that use Make-to-Stock supply chain type and 05 Moroccan aeronautic companies that use Ship-to-Stock supply chain type, object paragraph 3.1, more suited to the lean concept (Table 4), we note that 07 companies that have a standard product at different destinations and 05 companies that have a standard product at a single destination but 05 companies that have a constant demand for a standard product and 06 companies that have a varied demand for a standard product (Tables 8 & 9).
- Of the 20 Moroccan aeronautic companies that use Make-to-Order, object paragraph 3.1, more suited to the agile concept (Table 4), we note that 14 companies have a unique raw material with different products and 15 companies that have a demand for a range of varied and personalized products (Tables 8 & 9).
- And finally, for the 15 Moroccan aeronautic companies that use Assemble-to-Order, object paragraph 3.1, more suited to the leagile concept (Table 4), we note that 15 companies have a demand for a range of varied and customized products and 14 companies have different and modular products (Tables 8 & 9).

**Table 8:** Type of customer requests crossed by classification group

| If we classify the types of customer requests, what structure is closer in terms of the requests you receive in your business? | | Very variable product of demand | | Range of multiple and volumes products of demand | | Range of varied and customized products of demand | | Constant demand for a standard product | | Varied demand for a standard product | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Yes | No | Yes | No | Yes | No | Yes | No | Yes | No | |
| Classification Group? | (A) | 0 | 13 | 6 | 7 | 7 | 6 | 2 | 11 | 2 | 11 | 13 |
| | (B) | 3 | 16 | 7 | 12 | 7 | 12 | 2 | 17 | 2 | 17 | 19 |
| | (C) | 4 | 2 | 2 | 4 | 1 | 5 | 1 | 5 | 2 | 4 | 6 |
| Total | | 7 | 31 | 15 | 23 | 15 | 23 | 5 | 33 | 6 | 32 | 38 |

**Table 9:** Product range cross classification group

| If you classify the range of your products, what type is the closest to your products? | | Different RM Single Product | | Single RM Different Product | | Different modular Product | | Standard Product to Different Destinations | | Standard Product to Single Destination | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Classification Group? | (A) | 6 | 7 | 1 | 12 | 6 | 7 | 3 | 10 | 2 | 11 | 13 |
| | (B) | 2 | 17 | 11 | 8 | 6 | 13 | 2 | 17 | 4 | 15 | 19 |
| | (C) | 1 | 7 | 2 | 6 | 2 | 6 | 2 | 6 | 3 | 5 | 8 |
| Total | | 9 | 31 | 14 | 26 | 14 | 26 | 7 | 33 | 9 | 31 | 40 |

The table below summarizes the practicability environment of the Legality concept as well as the positioning of the corresponding DP. Thus, of the 42 responses, the customer demand of 27 Moroccan aeronautic companies is predictable on the different types of products and of the 39 responses, the product architecture of 23 Moroccan aeronautical companies is in modular form and the customer demand of 32 companies is foreseeable on the quantities produced. Finally, of the 41 responses, 21 Moroccan aeronautic companies have the capacity to adapt to sudden changes thanks to the interpretation of knowledge and 26 Moroccan aeronautical companies have the storage capacity to cope with fluctuations in demand (Table 10).

**Table 10:** Legality crossed by classification group

| | | Is the customer demand predictable on the different types of your company'sproducts? | | If you classify your products, what is the architecture closest to your products? | | Is the customer request foreseeable on the quantities produced? | | Does your company have the ability to adapt to sudden changes through the interpretation of knowledge? | | Does your company have storage capacity to cope with fluctuations in demand? | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | oui | non | architecture modulaire | architecture classique | oui | non | oui | non | oui | non |
| Groupe de classification? | (A) | 9 | 4 | 12 | 1 | 11 | 2 | 8 | 4 | 9 | 4 |
| | (B) | 12 | 8 | 6 | 12 | 14 | 4 | 12 | 8 | 14 | 5 |
| | (C) | 6 | 3 | 5 | 3 | 7 | 1 | 1 | 8 | 3 | 6 |
| Total | | 27 | 15 | 23 | 16 | 32 | 7 | 21 | 20 | 26 | 15 |

In conclusion, Moroccan aeronautical firms classified in group A according to the criterion of practicability of the Legality concept showed a satisfactory level of control of the positioning of the decoupling point favorable to the application of the concept Legality. It is the Assemble-to-Order supply chain characterized by a demand for a range of varied and customized products and different and modular products. Moreover, the analysis of multiple and simple linear regressions has demonstrated an important influence of the Legality concept's practicality on the performances of companies adopting this type of concept in terms of optimization of logistic flows taking into account the following five factors: cost, Time, quality, flexibility and responsiveness (Moussaid *et al*., 2017, p. 134) [14].

## 5. Conclusions

The DP has a key role in the development and management of value chains. Operations upstream of the DP perceive value differently from downstream. As a result, the two parties around this point should be designed and managed

differently in order to support the creation of value at each step. It allows the mastery of these logistic chains to integrate and optimize, in a global way, the physical flow. Its strong focus is to enable companies to better exploit the market, using the lean process, where demand is stable, and the agile process, where demand is volatile, while integrating the various actors in the logistics chain.

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