THE DIFFUSION OF JIT WITHIN THE PURCHASING FUNCTION:
IMPLICATIONS OF AN ORGANIZATIONAL INNOVATION
FOR THE FIRM AND ITS SUPPLIERS NETWORK

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Introduction

Close and extensive links between Japanese manufacturers and their parts suppliers go a long way in explaining their competitive advantage [1]. For example, a US automobile executive estimates that about a quarter of the cost advantage of Japanese firms is due to the superior efficiency of their network of suppliers [2]. The existence of a real suppliers network structure is a specificity of Japanese industry [3]. In this context TQC (Total Quality Control) and JIT (Just in time) take place in Buyer/Seller relationships. This is why the adoption of Japanese manufacturing techniques by Western firms should have a strong impact on the types of Buyer/Seller relationships developed by these firms. They generate a specific need for exchange in an industrial environment where the business networks are far the level of complexity reached by the Japanese [4].

This paper presents an approach of JIT purchasing * as well as results obtained from a study realized with 13 French firms in various industrial sectors and having all developed JIT actions in the purchasing field.

The research issues leading to this paper are:

1) To what extent firms in different industrial contexts have similar approaches to JIT purchasing problems ?

2) What are the changes induced by JIT in purchasing relationships ?

3) All the firms used the expression “JIT” to qualify their actions. Therefore is there one JIT purchasing practice or different practices of JIT purchasing ?

The ongoing research attempts to validate statistically, on a larger sample, the exploratory hypotheses of this study.

Literature review:

Most of the researchers interested in “business relationships” assert that such relationships must be considered as exchange processes where firms realize incremental adaptations [5], [6], [7], [8], [9]. In this perspective, exchange is always the center of the study. With JIT there appears a specific form of exchange in addition to the traditional form of “market exchange” and “relational exchange” [10]. JIT procurement has received considerable attention in the logistical management field where it features either as statistical studies on its implications [11], [12], [13], [14], [15], [16], [17] or normative reflections seeking a “one best way” to the problem particularly through observation of Japanese practices [18], [19], [20], [21], [22], [23], [24]. Some other more theoretical approaches attempt explanatory frameworks [25], [26] or use “theoretical filters” constituted by “network” [27] and “interaction” [28], [29] approaches. In our point of view, JIT purchasing is an “organizational” innovation for the buyer firm. So, in order to improve our perception of JIT purchasing practices, the literature relating to change in Organizations would be the basis of our research.

* The common goal of JIT purchasing involves the delivery of a specified product at a precise time and place, in the specified quality and quantity required by a buyer.
The JIT Purchasing as a process of organizational change:

Research in JIT purchasing practices are most often defined in a narrow sense. In fact, the business reality is not so harmonious: "Ask any two managers who have worked with it just what JIT is and does, and you are likely to hear wildly different answers" ([30], p40). For us a better knowledge of the phenomenon should take this diversity into account, considering JIT development as a real change process into the buyer Organization and its suppliers network. Thus, according to the way JIT is implemented in a firm, we should observe a continuum of situations ranging from a "real" JIT purchasing (a quasi-integration form [31] on a long term contract bases with single sourcing and the development of trust in exchange) to a simple "tense flow" (asking for more reactivity without changing nature of Buyer/Seller relationships).

A framework for JIT purchasing:

Figure 1 presents a conceptual framework for JIT change processes and its diffusion in the Purchasing Function. The firm's environmental factors (external and internal) determine the level of interest in JIT exchange within the Organization. These factors will influence the goals assigned to the Purchasing Function and consequently the level of change in Buyer/Seller relationships. As a result, there are a number of possible solutions for JIT implementation (from cooperation to coercion).

The pursuit of the same logistical goals (a way to reduce inventories) may generate practices more or less in keeping with the standard principles of JIT purchasing [32]. The objective of our research is to shed light on these different practices through the use of this exploratory framework (figure 1).

Research methodology:

The following empirical research examines the effect of the adoption of JIT exchange on the Purchasing Strategies of 13 French firms who were active in implementing JIT. Data were collected by in-depth personal interviews of Material Managers using semi-structured questionnaires. The firms in the sample are from various industries. We tried to choose firms that were similar from the JIT point of view.

In order to select firms in our sample, we used two common sense clues based on the relationship between JIT philosophy and Purchasing Function:

- The more firms are mass production oriented, the higher the level of interest for JIT organization (because such firms generate a lot of inventories).
- The more firm products are complex, the higher the number of parts managed by the Purchasing Function. In such firms the level of interest for an inventories reduction is also high.

These hypotheses imply the following typology based on these two criteria.

- The criterium of complexity

Complexity is related to the Production system and the degree of product complexity. Gouzy.Y and Kleffer.J.P [33] distinguish:

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**Fig 1: The JIT Diffusion to the Purchasing Function**
Assembling systems requiring the coordination of different material as the complexity of the final product increases.

Manufacturing systems where the principal constrains are about production processes with relatively simple purchase problems.

The criterium of production flow:

Hayes.R.H and Wheelwright.S [34] identify the influence of variety and volume on the structure of production systems. There are four process structures in their typology:

- Products with low volume and low standardization (production "one of a kind")
- Multiple products with low volume
- A few major products with higher volume
- A small number of standard products with high volume.

Therefore, we propose a typology based on these two criteria (figure 2). According to this typology we can divide our sample into three groups corresponding to three different industrial contexts on the JIT question:

G1: The mass production of complex products (Group A with 6 firms, especially household manufacturers)

G2: The low volume production of complex products (Group B with 4 firms in industrial equipment sector)

G3: The mass production of simple products (Group C with 3 firms in para-pharmaceutical sector)

JIT Diffusion to the Purchasing Function:

Strategic change is the modification of practices which link the firm to its environment in connection with a new strategic view. This is what happens when JIT is introduced in the firm. The question asked in this paper is "Is there a standard way to spread the JIT philosophy in the firm?". The following are the results of our findings.

According to the scope of change (JIT generalized or limited to purchasing), the depth of the change (a total modification of Buyer/Seller relationships vs a simple logistical change) and the imposed rhythm (a slow vs a rapid rhythm of change), two categories of change could be analyzed: Radical change and Evolutive change.

- Radical change:

Radical change could be qualified as major, global and rapid. For Giroux.N "It occurs with real or apprehended crisis. It is decided by top management which develops a meta-strategy, i.e the theory of change which can help it in its actions" ([35], p10). First, this "meta-strategy" acts at a "macro level", i.e the manager develops actions on the "structure" and the "culture" within the organization.

The common points in the Radical change diffusion process are:

- Change induced at the top management level.
- The existence of a trans-functional project.
- A Multi-level implementation, scheme which embraces:
  - Organization
  - Culture
  - Systems and methods

- Evolutive change:

For Giroux.N "It is characterized by a gradual transformation taking place in the usual course of the firm's activities" ([35], p12). Whether initiated by top management or at the operational level we can perceive two approaches to "Evolutive change": an "incremental" approach and a "reactive" approach.

- Incremental change:

Quinn.J.B [36] defines it as a conscious and proactive process of change. This change is directed through successive touches by top management. Therefore, the manager's actions are less directive than in the "Radical change" approach. He decides the order of priorities, selects the change procedures, but generally decisions are taken within an inter-functional negotiation process (concentric process) without a formal JIT project.

- Reactive change:

Ansoff.H.I [37] defines it as a series of adaptations, emanating from an operational level, in reaction to an environmental change. A "bottom/up" process is substituted to the "top/down" process of the radical change. Thus, the operational decisions taken in the Purchasing Function allow new strategic opportunities (product development, "make or buy" decision...).

Figure 3 is a synopsis of the preceding development.
### Elements of Change

<table>
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<th>Change Models</th>
<th>Radical</th>
<th>Adaptable</th>
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<td><strong>Temporal pressure</strong></td>
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<td><strong>Initiator</strong></td>
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<td>Top management</td>
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<td><strong>Implementation</strong></td>
<td>Project team conducted by the top management or a &quot;champion&quot;</td>
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<td><strong>Sample's firms</strong></td>
<td>A1, A2, A3, B1, B2, B3, B4</td>
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### Empirical Findings

The Three theoretical change processes can be found in the sample, even if "Radical" change is dominant in sectors where potential JIT interest is high (Groups A and B). For example, in the C1 and C2 firms (para-pharmaceutical sector), the JIT idea is introduced by top Management after a visit in Japan. But in these cases, if top Management may control change through results, decisions about the scope and the rhythm of change are decentralized towards the functions involved (we call this a "managed tense flow"). The purchasing function of firms A4, A5 and C3 share the lack of clear objectives about JIT from top Management (except objective on inventories reduction). In these firms a large amount of energy is dedicated to informal negotiations with other functions about JIT. Thus, according to the C3's Material Manager "The available forecasts are of bad quality, and must be improved by the development of a better internal diffusion of information through informal discussions by the buyers within the organization". For these firms, the pressures of short term goals and the lack of top management support results in what we call a "simple tense flow" i.e a logistical change without a real modification of Buyer/Seller relationships.

One hypothesis we wish to validate is that the more JIT change process is akin to the "Radical" approach, the more this change will be efficient within the Purchasing Function and its suppliers network.

The A6 firm is a good illustration of the need for a centralized coordination in JIT exchange. A few years ago, the management of this firm was confronted to deep changes in market demand (competitive pressures for differentiation and fast production).

It was a real upheaval to the traditional production. The first reaction of Management was to leave each function involved to change in a "reactive" way. "Individual actions without a "system vision" were undertaken in response. In face of new production requirements, which we had externalised to suppliers, the latter threatened to leave the market because our orders were no more in line with their industrial structure" relate the A6's Material Manager.

The reaction of Management was the founding of a collegiate decision structure "to avoid the pursuit of local functional performances ".

Thus, Firm A6 who had started the JIT exchange in a "reactive" way is now closer to a "radical" change starting a standardization of its JIT purchasing approach.

In conclusion; we think that the application of the JIT philosophy implicates a deep change in the nature of Buyer/Seller relationships. Thus a strong implication of top Management seems absolutely necessary to reap the full harvests of JIT exchange.

### Change relationship in the JIT environment

To introduce JIT in the Buyer/Seller relationships is to modify the relational balance existing before change. Indeed, JIT involves the delivery of a specified product at a precise time and place, in a specified quality and quantity required by the buyer.
To analyse this change with a dynamic view we can adapt the IMP Interaction Process model to the JIT purchasing problem (figure 4).

In this model, the basic elements of business interaction are "episodes" (the short term aspects of that relationship connected with a particular order) and "relationships" (the long term aspects of that relationship which both affect and may be affected by each episode).

Therefore, the diffusion of JIT requirements in the relationship involves a change from cell III (a close relationship that simplify the episode) to cell IV (a crisis situation where it's hard to manage the purchasing actions). In fact, the routine developed before with the suppliers network to simplify the episodes are out of order. The interaction process becomes more complex. The question is "what can the buyer do to balance the relationship (come back from IV to III) ?"

In this point of view, the development of JIT on Buyer/Seller relationships introduces a change in work relations with the suppliers network. Therefore, it's in "Organizational change theory" that we can find the framework to analyse the actions to balance the relationship.

* The contribution of Organizational change theory

For the buyer, introducing JIT in purchasing is to ask the supplier to change his work pattern for exchange. What can we learn from Organizational theory on technical change?

Coeh.L and French.R.P (39) for example, underline that often in the process of change, resistance is not against technical change but rather against change in social relationships accompanying it.

For Lawrence.P.R "it will be useful for our purpose to think of change as having both a technical and a social aspect. The technical aspect of the change is the making of measurable modification in the physical routines of the job. The social aspect of the change refers to the way those affected by it think will alter their established relationships in the organization" (401, p 185).

To change the technical aspects without modifying the social aspects is equivalent to breaking the balance of work relationships and generating resistance to change. Leavitt.H.J (41) summarizes change in Organizations as multidimensional systems in which at least four variables interact (figure 5):

- *Task* refers to organizational "raisons d'être" of the relationship (the definition of the operator's work)
- *Technology* refers to technical tools and problems-solving inventions to realize the task defined by the Organization.
- *Actors* refers to the characteristics of people in the Organization (personality, qualifications...) but also to the nature of the relationship (trust, work atmosphere...)
- *Structure* refers to the systems of communication, systems of authority and systems of work flow within the Organization.

For Leavitt.H.J "These four are highly interdependent, so that change in any one will most probably result in compensatory (or retaliatory) change in other. In discussing organizational change, therefore, I shall assume that it is one or more of these variables that we seek to change" (41), p199.

The following framework is constructed by analogy with Leavitt's. Therefore, implementing a JIT purchasing exchange with suppliers could be summarized by four types of actions.

- *FLOW* refers to the changes in delivery, quality, packaging and price conditions for the "episode" of the exchange.
- *CHANGE TOOLS* refers to buyer firm investments (human and material) in the relationship. These are made to facilitate the management of change and its acceptance by suppliers. We can identify two types of tools.
  - Change communication tools ("Suppliers day", buyer's visits, "JIT handbook...")
  - Change conversion tools. They can be:
    - coercitive (penalties system for example)
    - non-coercitive (technical help and JIT training of the supplier...)
    - contractual (type of purchase contract)
- *RELATIONAL ASPECT* refers to change in buying company's sourcing policies.
- *ORGANIZATION OF CHANGE* refers to change in the systems of authority.
of the Purchasing Function, but also to the systems of communication and of work flow with the other Functions involved in JIT project.

All decisions on these four areas constitute what we call the "JIT purchasing mix" (figure 6). One of our hypotheses is that the buyer firm's ability to manage change on all four variables (fit) is the most important rule to reach effectiveness in JIT implementation.

Results of the empirical research:

The main aim of this paper is to examine the influence of JIT philosophy adoption on the buyer practices to balance the relationship. So the research has taken the form of structured interviews with Material Managers in each company. The interviews were based on a series of prepared questions grouped into four categories following the "JIT purchasing mix" framework. Three of these are discussed here.

a) Change tools:

- The change communication tools:
In the Automobile industry, the first suppliers conversions to JIT was realized in a rough manner with a simple communication of the new requirements to suppliers and no negotiations. All thirteen companies have preferred personal communication with suppliers often jointly with the organization of "suppliers day" (for seven firms on the sample). For A1's Material Manager "it's a nonsense to dictate a relationship if our supplier is not able to realize it. We must negotiate first".

- Change conversion tools
It concerns specific actions for JIT exchange developed by the buyer to facilitate the supplier's conversion ("non-coercitive tools") or to constrain him to JIT delivery ("coercitive or "contractual" tools).

With "non-coercitive" tools, the buyer tries to develop "commitment" with supplier by increasing his "motivational investment" [42] in JIT exchange. The main tools are, by order of use in our sample.

- To show potential gains to the supplier.
- To adapt our demand to the supplier's real possibilities.
- To train the supplier for JIT.
- To help the supplier in his production management change
- To provide the supplier with inventory financing.
- To accept price increase.

On "coercitive" tools, only two of the thirteen companies (A2 and A5) claimed that they created specific penalties system for JIT exchange. Nevertheless, all companies have negociated financial resorts in a supplier failure case. But for the companies involved in JIT relationships, the most important is to develop specific supplier performance measurements.

On "contractual tools", there is little evidence that any of the companies adopting a JIT exchange has significantly changed its type of purchase contracts. Only four of them (A1, A5, B1, B3) have concluded a specific JIT contract with their suppliers. On the whole, those contracts (in our sample, on a two- or three-years basis) require two parts:

- an "open-contract" which defines the technico-economic data for the relationship.
- a delivery programme which defines the "episode" within the relationship (order quantities, delivery days, packaging definition...).

For the other companies, there're only agreements on informal bases and no change in contracts with the JIT exchange.

Another "contractual" tool is the development of "stability agreements". This clause assures the supplier the furnishment of % of total purchase of a particular product (reference) on a given period of time. This non-competitive practice divides the sample. Seven firms (A1, A2, A4, A5, B1, B2, C2) use this clause in various ways. A2's experience shows the advantage of it. "Our "privileged" suppliers receive 60 % of the market for a special part. The other 40 % are for secondary suppliers who are very performant at the Production level. The argument for this sharing is the following:

- "Privileged" suppliers must be able to help us in product development. For those suppliers a "Research and Development" department is necessary. Therefore, the 60 % market share fits with the minimum to cover the supplier's Research and Development costs.

- Secondary suppliers must have a good production ability. Without a "Research and Development" department, their prices will be very competitive and they can profit from the Research findings of "privileged" suppliers".

In the long run, the risk is in a price increase. Thus, the buyer firm often links this clause to "costs transparency" for the supplier.

Another change tool is the modification of the organization of transport for the JIT purchasing parts. All of the thirteen companies have purchase contracts on "carriage free"
bases. On the other hand, four companies (A1, A3, B1, B2) organize JIT purchasing collection to reduce the transport costs. This arrangement ("carriage free" purchasing + purchasing collection) requests these firms to conclude tri-partite contracts:

\[ \text{customer - supplier - carrier} \]

b) Relational aspect:

"Relational aspect" refers to changes in buying company's sourcing policies to support JIT purchasing relationships. A "consolidation" strategy for the supplier base is visible in all thirteen companies, but "single sourcing" is not generalized (only in four companies). Five companies have adopted "dual sourcing" for JIT purchasing parts. The other have no specific sourcing policy. However, contrary to the Japanese experience which suggests tight links between suppliers and their principal buying company [43], 20 to 30% (in our sample) were quoted as the maximum portion of supplier's capacity that the buyer company would be willing to take. This fact is consistent with previous empirical investigations (129, 441).

c) Organizational aspect:

The "journey" to JIT purchasing implementation can be achieved by some organizational changes. Therefore, in our sample, eight companies have created a "conducted structure" for JIT diffusion (an inter-functional decision center). Two of them have specialized buyers in the JIT parts management. Moreover, the partition between "Purchasing" and "Supplying" functions is generalized with JIT exchange. Finally, there's a real contact network created in the buying firm including Purchasing, Engineering, Quality... This broadening of the "buying center" is consistent with other studies (45) and increase the communication need among functions.

Concluding remarks:

The main aim of this exploratory research was to provide a framework to analyse JIT buying strategies. The specificity of our approach lies in:

- A dynamic analysis of change taking into account the mode of transfer of JIT philosophy and its influence on purchasing practices.
- A conceptual framework for change analysis (the "JIT purchasing mix").

Despite the small number of relationships investigated, we have now a better knowledge of "JIT purchasing mix" constituents. The next step in our research is statistical validation, on a broader sample, with the intention to elaborate a JIT purchasing typology according to our conceptual framework.

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