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Cooperation in Supply Chains: from practical problems to conceptual models

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Abstract. Improving the performance of supply chains is a critical issue in nowadays industry. In that purpose, cooperation between partners motivates a great attention. Technical aspects of current cooperation procedures as promoted by large companies are firstly described, and compared to some real problems identified after interviews in the aeronautical industry. Technical issues are in our opinion insufficient for fully explaining the described situations. Therefore, behavioral concepts suggested in the literature of management and sociology of organizations are explored and conceptual models linking the selected concepts are suggested, allowing to have a deeper understanding of real cooperation situations.

Keywords: Supply chain, cooperation, trust, partnership.

1 Introduction

Relationships between SMEs and large companies is a critical issue in the aeronautic context. Within different frameworks, the authors have participated to interviews of supply chain's partners of the aeronautic industry in the South-West of France, and to projects involving them. On the base of these interviews, concepts suggested in the areas of management and sociology of organizations have been considered for formalizing cooperation situations in supply chains.

2 Improvements of Supply Chains: a Technical View

The challenge of supply chain management is to coordinate companies of different sizes and cultures, which have local strategies and objectives, in a way which satisfies the global objectives of the supply chain. Two main principles may be used for an operational coordination of the partners in a supply chain: centralized or decentralized planning. In practice, centralized planning using APS (Advanced Planning Systems

[1]) is not adapted to the coordination of independent entities, which have to preserve their autonomy. "Push" and "pull" methods may be used for a point-to-point management of Supply chains. MRP (Manufacturing Resource Planning [2]) is the most well known of the push methods. "Pull" methods, like just-in-time and lean manufacturing require a drastic simplification of the material flows, resulting in a simplified management.

The strategy of the focal companies of the aeronautical domain mainly consists in spreading the principles and tools of MRP towards their suppliers, especially the smallest ones. Huge efforts for increasing the flexibility and reactivity of the chain through lean manufacturing have also been recently made. Some critical aspects of the point of view of suppliers and customers on these questions, and more generally on cooperation, are summarized in next section.

3 Summary of Interviews and Projects

The situations described afterwards have mainly been identified through projects and interviews involving around 20 SMEs and 5 large companies (see details in [3, 4]).

3.1 Customers Points of View

The efforts of the large customers for improving SC performance are mainly directed on the SMEs, for which they have noticed that the service ratio is conversely proportional to the load. In order to address this problem, the customers have a multi-faceted strategy:

- Some of them try to protect their weaker suppliers, for instance by giving them programs with larger firm periods than their customers do for themselves.
- Most of the customers ask for evidences of proper use of production management tools before agreeing a supplier. For instance, some of them ask for examples of a middle term load planning, for being sure that the supplier is able to create a "control loop" giving him some visibility.
- The customers ask their suppliers to be certified, in order to show their capacity in Quality Management. Suppliers which are not yet "mature" in production management, but are considered as having a "potential" of development are selected for "supplier development" projects. Techniques such as MRP or Lean Manufacturing are mainly promoted in that purpose.
- One of the customers informs his suppliers on his stock level, so that they can anticipate the real effect of a late delivery. The aim is to increase the sense of responsibility of the supplier.
- For large companies, there will be soon a "critical size" for participating in an aeronautical supply chain.
- SMEs are encouraged to join "clusters" for reaching this size. The objective is to simplify the management of the supply chain by decreasing the number of partners. In spite of these efforts, the large companies are globally disappointed by the goodwill of their suppliers, and by the effects of their projects.

3.2 Suppliers Points of View

Production management is indeed considered as an "administrative work" by many SMEs. The logic of the MRP method is often poorly understood: having an a-priori estimation of their internal cycle times is for instance considered as impossible for most of the SMEs. On the opposite, they all have developed internal procedures allowing to group orders according to technological constraints in order to decrease set-up times, and so to meet the customer's expectations regarding the costs. These calculations are performed on MS Excel© or on MS Access©, the resulting production plan being not re-introduced in the production management system.

The long supply times of some alloys (around one year) make that firm orders have to be sent to the raw material providers on the base of uncertain programs. For the suppliers, "risk sharing" promoted by customers mainly means "risk sent to the suppliers" since they do not see the protective aspects included in their contracts. Moreover, their contract often includes an article saying that it could be cancelled as soon as better prices were got from another supplier¹. All the suppliers gave us examples of more and more complex parts removed from their production plan for being processed in low cost countries, sometimes without explanation... Specific requirements are always added by the customers to standard certifications (like ISO 9000). A surface treatment company was for instance subject to a certification of 800 product/process couples per year. For all the suppliers, dialog is more and more difficult with the customers, since their contacts are often managed by young engineers having a poor technical competence on the processes, but a hard pressure concerning costs and delays. Lean manufacturing is often considered as an attempt of the customers to decrease their autonomy; a "first in-first out" logic is for instance promoted for surface treatment companies, which internal delays are hardly predictable by the customers. In that case, the SME would not be able to have its own strategy regarding priorities, for example they use to privilege the interests of the "best" customer. The possibility that small companies define their own way for continuous improvement was discussed during a public debate gathering large and small companies. A person from a large company cut the debate arguing that "it was very dangerous to let SMEs think that they can do what they want. The solutions being known, the only problem for SMEs was to implement them...".

We shall show in next section that concepts currently used by academics from management science or sociology of organizations may provide an interesting point of view on these issues.

4 Concepts Linked to Behavioral Issues in Supply Chains

Risks in supply chains are usually associated either to product demand or to product supply (linked to capacity limitations, supply disruptions) [5]. The buyer can try to cope with the risks linked to the necessity to synchronize actions with its suppliers by formalizing communication rules, while keeping a clear distance with them: this

¹ For the customers, this point is only meant for keeping some pressure, since they consider that the suppliers know that approving a new supplier is a costly and long procedure.

strategy is called "arm's length relationship" in the literature, and can be compared to the "formal contracted rules and procedures" considered by Williamson [6]. Anyway, collaborative arrangements are nowadays preferred to arm's length trading or full integration approaches (see for instance [7]). Cooperation is sustained by communication and knowledge sharing and is considered both as a way to cope with risk and as a new potential source of risk, since it creates the opportunity that a partner exploits the other [8]. To avoid this, the first solution for the customer is to "control" the supplier: "control mechanisms are necessary to reduce opportunistic behaviors" [9]. Control requires power; the relative power of an organization over another is the result of the net dependence² of the one on the other [10]. Coercive power (punishment and reward), non coercive power (which indirectly affects the partner's behavior by changing its business objectives, etc.), contracts and relational norms are usual control mechanisms. Coercive power decreases the risk linked to cooperation at short term, but leads to conflicts [11], reduce willingness to cooperate [12], damage channel's member satisfaction [12], and causes the collapse of mutual trust and commitment [13]. Coercive strategies decrease the extent of shared beliefs [14]. On the opposite, non coercive power focuses on common beliefs and attitudes.

"Supplier development" summarizes efforts made by a buyer in order to increase the number of viable suppliers and improve supplier's performance or capability [15]. A problem is that the buyers must determine what knowledge and resource investments are likely to yield benefits if transferred to suppliers [16]. If the appropriate mechanisms are not in place, the suppliers may not perceive the benefits associated with these investments and may reject the initiative to modify or improve their processes [16].

Verbeek [17] uses the "script" concept [18, 19] for suggesting that technological prescriptions may be used in supply chains for influencing human actions. For us, the MRP method, the production management tools or the lean manufacturing principles can be seen as "scripts" aiming at substituting to the informal culture of the small suppliers, based on tacit knowledge, formalized procedures allowing to better predict the supplier's behavior.

The contract is also supposed to protect against opportunistic behaviors [6] by creating formal rules and procedures. Nevertheless, contracts seem unable to completely prevent opportunism and conflicts are most of the time solved without references to the legal aspects [20].

Trust is often seen as an alternative to power: it allows decreasing the required level of monitoring of the relationship [8] and is an antecedent to cooperative behavior [21]. The role of trust in cooperation has been a prominent theme in the literature on buyer-supplier relationship [7]. Trust is defined in SCM as the belief that an exchange partner's work of promise is reliable and that the partner will fulfill his obligations [22, 23]. For [21], supplier's trust results from supplier's perception of buyer's benevolence³, but also from supplier's perception of buyer's dependability. On the opposite, buyer-supplier relationships characterized by asymmetric

² Buchanan [29] conceptualized power-dependence imbalances in buyer-supplier relationships as the difference in value that buyers and sellers attach to the relationship.

³ Benevolence is usually defined as providing proprietary information or providing assistance without compensation [7].

interdependence are often believed to be deficient because the independent partner holds higher power and might be attempted to exploit it [25, 26, 27]. A high level of total interdependence is usually considered as an indicator for a strong, cooperative long-term relationship in which both parties have invested; mutual trust and mutual commitment will characterize those relationships [27].

In our opinion, these concepts have a direct "echo" with the situations related in section 3. We shall attempt in next section to formalize the links between these concepts and to apply the resulting framework on the situations identified through the interviews.

5 Modeling the Cooperation Context

Human behaviors can hardly be described by simple models: our goal is not here to describe cooperative situations under a deterministic formalism, but to underline different possible "circuits of interaction" between the attributes of cooperation, based on the literature analyzed in previous section. These interactions may make the cooperation situation evolve either positively or negatively.

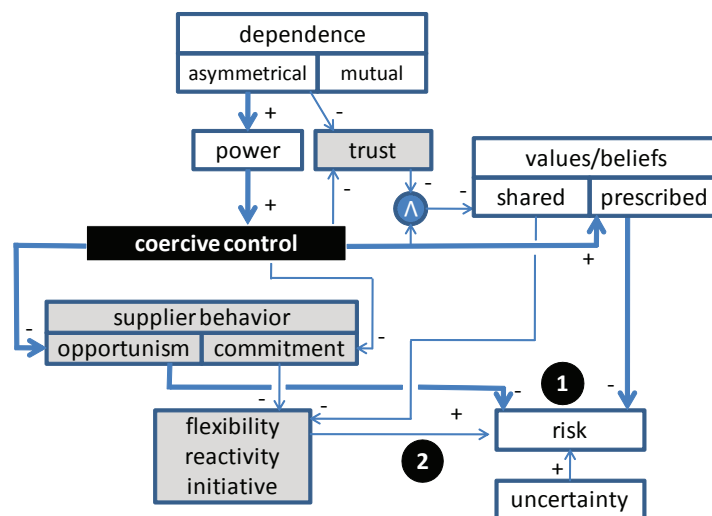


Fig. 1. Limitations of coercive control

Within the various concepts listed in previous section, let us distinguish between:

- those describing the context of the relationship, e.g. level of dependence of the partners, risks that they are facing (white boxes in the figures) etc.,
- the attitudes of the partners (willingness to cooperate, trust, opportunism, etc...) (grey boxes in the figures),
- the actions (control, influence, information sharing), which influence/are influenced both by the context and attitudes (black boxes in the figures).

In Figures 1 and 2, an attempt has been made to suggest qualitative models for

describing the type of relation between two entities. As usually in such models, "+" means that an increase of the level of the influencing entity provokes an increase of the level of the influenced one (conversely for "-").

In Figure 1 are summarized as an example the limitations of coercive control in the present context of aeronautical supply chains. In bold lines is suggested a classical reasoning of the customers: the dependence of the supplier (as it is usually the case when suppliers are SMEs) gives power to the customer. Power creates the possibility to mitigate risk (mainly due to uncertainties) by controlling the suppliers through coercive control, in order to prevent opportunistic behaviors. The limitation of these opportunistic behaviors is considered as decreasing the risk. Similarly, coercive control also allows to prescribe values/beliefs/tools which should participate to decrease the level of risk. In the situations described in section 3, the possibility to cancel a contract is an example of threat clearly linked to coercive control. Imposing the use of production management tools can be seen as prescribing values (see the "script" concept). Number "1" on Figure 1 shows the expected decrease of risk as a result from these actions. The interviews clearly show the possibility of other - less favorable - interactions: asymmetrical dependence and coercive control decrease trust, which prevents from adopting the customer's prescribed values, especially if they are far from the culture of the SMEs preferring action to procedures [28]. While limiting opportunism, coercive control also limits commitment, preventing the supplier from taking initiatives and decreasing its flexibility and reactivity. As a result, the possibility exists that risks are increased (circuit 2 on Figure 1) more than decreased by the conditions of control.

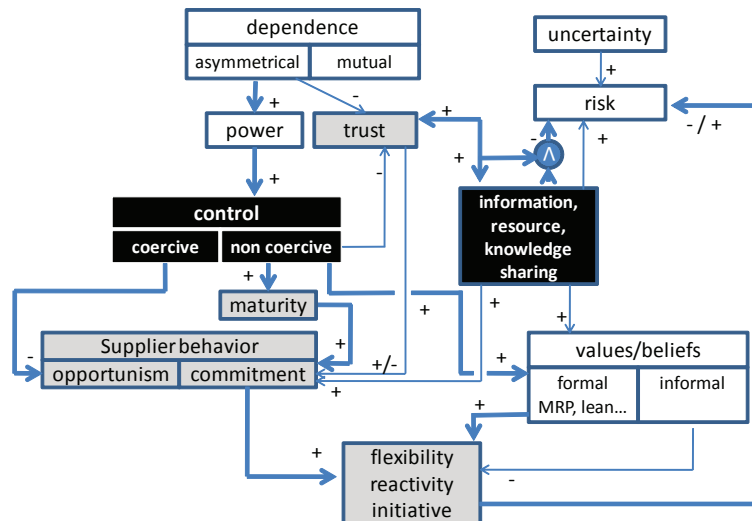


Fig. 2. Limitations of supplier development

In Figure 2 are illustrated some problems linked to supplier development. "Maturity" is considered as linked to the use of formalized methods, like MRP or lean manufacturing. As seen in the interviews, some (rare) companies are also open to information sharing (e.g. concerning their stock level) for increasing the

consciousness of the suppliers, and to show their own trust. This "virtuous" circuit may be possible in some cases, but it suffers in our opinion from an "original sin": the asymmetrical dependence between partners, which reassures the customers but prevents real trust to be established from the supplier's side. Indeed, the power of the large companies make that SMEs must show an appearance of adoption of these new methods and tools, even if these new values are not fully shared. The formal values/beliefs transmitted to the suppliers, not fully understood nor used, may decrease the use of the traditional "informal" methods insuring reactivity, and may as a consequence participate to increasing risk.

6 Conclusion

Through some real examples, we have tried to show that the efforts conducted by large companies of the aeronautic sector for improving their cooperation with their small suppliers do not always have the expected effects. Concepts suggested in the domains of sociology of organizations and management have been used in order to provide a better understanding of the observed situations. The first perspectives of this preliminary work concern the production of complementary conceptual models linked to other situations. The validation of these models will then be addressed, including the definition of criteria allowing a quantitative assessment of the identified behaviors. The diagnosis of the reasons of the observed attitudes and beliefs, based both on technical and behavioral aspects, will then be addressed.

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