PARTNERSHIPS OF TUG OF WAR?
(A framework for supply-chain improvement)

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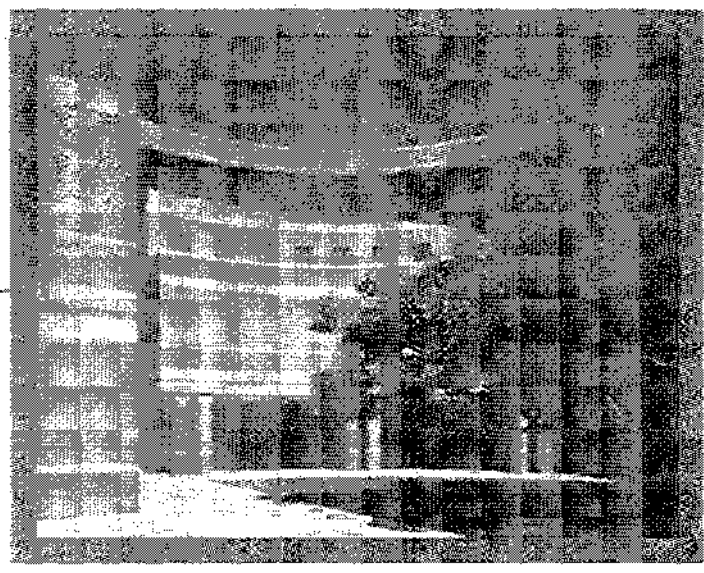

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Abstract

Forming closer partnerships with suppliers or customers can yield substantial benefits as a slew of examples in the business literature show. In the absence of such a partnership, the "bullwhip effect" recently described by Lee et al. will kick in and cause serious inefficiencies throughout the supply chain. Though several characteristics of successful partnerships are brought up time and again – mutual trust, commitment to the partnership, open information exchange – the literature remains strangely silent on the detailed mechanics of the *process* involved in getting there. For a large and all-powerful customer this may not matter much, but what if the *supplier* is driving the process? And how can the supplier make sure to reap the commercial benefits from their efforts?

We describe how a supplier initiated two cases of such joint supply-chain improvement efforts, the first guided primarily by trial and (frequent) error, the second seemingly much more streamlined, but both eventually leading to a mixture of success and disappointment. By contrasting the two, we identify various *critical factors* for smooth project progress, including the need to have a clearly defined process, the composition of the joint project team, and the importance of supply-chain mapping. We pull together the key learnings into a simple framework which can be seen as a "*roadmap*" for joint supply-chain improvement projects, and offer guidelines on managing the overall process and the individual steps. We briefly describe the company training programme through which the framework was implemented and the type of coordination structure needed to support such projects. Finally, we analyze why the first case was eventually *commercially* more successful, even though the second case was more successful at the *project* level: successfully improving relations with suppliers or customers also requires corresponding realignment of *internal* relations between departments.

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Introduction

Advantages of partnership. It is by now well-known that by working more closely together, customers and suppliers can create far more competitive supply chains. Failing to do so causes information to be distorted as it moves through a supply chain, which in turn can lead to tremendous inefficiencies. This "bullwhip effect" and how it results in excessive inventories and poor responsiveness was recently described by Lee, Padmanabhan and Whang (1997). By exchanging information more openly, more frequently, and more accurately, customers and suppliers can eliminate many of these problems. Examples of successful customer-supplier partnerships, such as between Baxter and American Hospital Supplies (Byrnes, 1993) or between Toyota with its first-tier suppliers, are spreading fast. These and other firms have reaped major benefits from these partnerships, through increased market share, inventory reductions, improved delivery service, improved quality, shorter product development cycles, etc. Even on a less grand scale than a full-fledged company-wide partnership, an improved customer-supplier relationship often leads to quick improvements in logistics, through the more open information exchange and better coordination compared to a more traditional arm's-length or adversarial relationship.

Characteristics of successful partnerships. Several studies have contrasted successful partnerships with more arm's-length relationships, finding some key characteristics that recur time and again. More open information exchange, eg. of cost and demand data, and coordinated decision-making can go a long way toward reducing the inefficiencies inherent in arm's-length relationships. Mutual trust is crucial, eg. to reassure firms that information shared with a partner will not be used against them. Longer-term commitment to the partnership is needed, to encourage parties to invest in further improving the joint supply chain to mutual advantage. These issues are studied in among others Anderson and Weitz (1992) and Magrath and Hardy (1994). In the same vein, Helper (1991) and Helper and Sako (1995) distinguish between an "exit" and a "voice" relationship; in the latter, customers and suppliers work closely together to resolve problems rather than find a different business partner. They found that partnerships with a "voice" relationship perform better, but also that relatively few firms have such a partnership.

But how to get there? Although recognizing distinguishing characteristics of successful partnerships is important, this still leaves several key questions for suppliers wishing to embark on partnership drives with customers (or vice versa):

1. How can one build such a partnership over time, especially when the relationship with the customer or supplier in question has hitherto been more arm's-length? Ie., how to encourage information exchange, build trust, and create a longer-term commitment in such a context?
2. How can the partners-to-be overcome or avoid the obstacles they will almost inevitably encounter?
3. How can the supplier make sure to reap commercial value from his efforts, through e.g. increased volume or reduced price pressure from the customer?

To a large extent, existing literature ignores these "how-to" questions and focuses on successful partnerships rather than on the obstacles faced in getting there or on failed attempts. One exception to this rule is Byrnes and Shapiro (1991), and some of their findings on the critical factors in such projects do indeed correspond to ours. We go a step further by integrating these critical factors into an operational framework to address the key questions above and to guide suppliers intending to initiate joint supply-chain improvement projects. It is based on our experience working with a large multinational chemical company, Pellton International,[1] seeking to improve supply-chain logistics jointly with their customers. We start by describing two joint supply-chain improvement (JoSCI) projects initiated by Pellton. Their first, with Basco PLC, was driven largely by trial-and-error; progress was slow and faltered several times, but was eventually considered successful, leading to *logistics* benefits and to helping to turn around a traditionally fairly adversarial relationship which, in turn, translated into *commercial* benefits for Pellton. The second project, with Perdirelli Milan, promised similar logistics benefits in far less time but, in the end, did not yield the commercial value Pellton had hoped for.

Learning from experience. By contrasting the two projects, we (tentatively) identify some key steps in JoSCI projects, notably the importance of having an agreed-upon process to follow, of selection of the joint project team, and of including supply-chain mapping early on in the project. These and other findings were subsequently tested and refined by participating in and following several other JoSCI projects, which we do not describe here. We then pull the learnings together into a simple framework which can be seen as a "roadmap" for JoSCI projects, suggesting the

[1] Company names and various other details have been disguised for reasons of confidentiality.

key steps to be taken in such a project and offering guidelines for each. The steps of the roadmap may not come as a surprise in themselves, but the cases do suggest several critical lessons:

1. It is helpful to have a mutually agreed *process and objectives* before embarking on a JoSCI project.
2. Thorough *preparation* is key: team selection, benefit sharing agreements, analysis of opportunities, supply-chain mapping, choosing performance measures, recognizing and allocating the required resources.
3. Reaping the commercial benefits requires that the JoSCI efforts be well-integrated within the respective organizations, especially within the customer's purchasing group. Benefits also need to be gained by departments providing the resources, especially in matrix organizations.

These are the issues we focus on, though of course project management and implementation are as important here as anywhere else. We sketch how this roadmap was implemented through a company training program, focusing on supply-chain management in general and the JoSCI framework in particular. We also describe requirements on the internal coordination structure for implementing and managing such efforts on a larger scale. Finally, we explain why the Basco project was eventually commercially successful despite being initially slow, whereas the Perdirelli seemed far smoother but led to commercial disappointment for Pellton.

Background of the case

Pellton International: supplying chemicals to automotive suppliers

Product and process. Pellton International is a multinational firm supplying a chemical Pell-Q to (among others) automotive suppliers, as depicted in Figure 1. Pell-Q is delivered in various different formulations and sizes; all told, several thousand SKUs. It uses global sourcing, with a small number of high-capacity production lines world-wide, where the various formulations are produced in batches ranging from several hours to several days. Changeover times vary from several minutes to a full day, depending on the products involved. Cycle times between batches of the same product range from 10 days to six months. Process quality and changeover times are highly variable. Pell-Q is cut to size and packaged to customer specifications on-line and stored until shipped. Pellton is the largest supplier with approximately 30% of the total market; four

competitors share the balance. We focus on Europe, which Pellton supplies from its plant in Maastricht, The Netherlands. Basco PLC is Pellton's largest customer and accounts for 20% of their output; Perdirelli follows with 15%. Basco and Perdirelli and their competitors each supply to several auto assemblers. A very limited number of auto assembly plants use single sourcing. Pell-Q is a key raw material for Pellton's customers, most of whom are under heavy cost pressure, especially those supplying to OEM producers.

Their question: how to set up future joint supply-chain improvement projects?

How to capture learnings from first JoSCI projects? In October 1995, Pellton was in the midst of supply-chain improvement projects with two key customers. By that time, the potential benefits of such projects had become clear, and they intended to initiate similar projects with many important customers world-wide. However, the first two projects had also proved highly resource-intensive, and had largely been driven by a single logistics manager. Moreover, the first project had encountered numerous obstacles and delays, many of which had later been avoided in the second. To set up such projects on a larger scale, they needed to capture the learnings from these experiences and carry them over to others within the organization. The aim of our project with Pellton was precisely that: documentation, improvement, and formalization of the supply-chain improvement process, and assistance in developing and delivering the necessary training materials. Below we sketch the first two JoSCI projects, the first with Basco PLC in some detail, the second with Perdirelli's Milan plant only briefly. Chronological summaries of both projects are given in Figure 2.

Basco PLC (Case 1): slow and painful, but eventually successful

Basco PLC: background

Basco moves to centralized purchasing. Relations between Pellton and Basco, its largest customer, have long been rather adversarial. Purchasing of strategic products, including Pell-Q, was being centralized at Basco Purchasing, which would manage negotiations with key suppliers and operate as a service center to Basco production sites. Basco Purchasing and Pellton came to

realize that some form of partnership was needed; they reached a long-term commercial agreement, exchanging volume commitments for price concessions.

Logistics: aiming for SKU rationalization and consignment stock

Preparing the first workshop. During 1993, Pellton underwent major business redesign, which included setting up joint workshops with major customers to find out how to serve them better. Initial discussions with the Basco Purchasing group identified cost reduction as their overriding concern, so the objective of the first workshop was defined as "finding ways to reduce the cost of supplying Pell-Q".

The first workshop. The first workshop, in early 1994, had some 20 participants: from Basco Purchasing the managing director and chemicals purchasing director, the technical director of Basco and an assistant, and several Basco plant-level production and logistics managers. From Pellton the commercial director, sales manager, logistics manager, and several other sales and manufacturing staff attended. The commercial director opened by showing that a single Basco plant took over 60 different SKUs. That plant's logistics manager was sceptical: "we don't take all that, I don't believe it". No specific plans resulted, but they agreed that Pellton would draw up a list of proposals to be refined before a follow-up workshop two months later.

Working towards SKU rationalization. Afterwards, the sceptical Basco logistics manager did some homework and found, to his surprise, that Pellton's commercial director had not exaggerated. That convinced him of the need to work together. SKU rationalization was identified as a major opportunity: rather than supplying Pell-Q in every possible size, Pellton would offer only a more limited variety. This would allow substantial safety stock reductions, improved delivery service, and less rush-order-induced disruption for Pellton. They would have to reach agreement on how to compensate Basco for the additional trim losses they would incur by having a more limited variety of sizes to choose from; offering consignment stock would be part of that compensation.

The second workshop: agreeing on three projects. The second workshop saw changes in team members on both sides. The team agreed on three projects for further study: 1) inventory reduction; 2) bar coding; 3) packaging. A steering team was formed to oversee progress; it

included the Pellton logistics manager and the Basco Purchasing chemicals purchasing director as main actors. Teams drawn from both companies were assigned to the three subprojects. Three years on, packaging has essentially become an internal Pellton affair; bar coding was abandoned as the team realized the goal and scope were not sufficiently clear.

Aiming for inventory reduction. The inventory reduction team was composed of logistics managers and sales staff from Pellton, a plant-level purchaser and logistics managers from Basco, and was led by the Basco Purchasing chemicals purchasing director. They first met in the Spring of 1994, and set three priorities: SKU rationalization, improving and integrating forecasting and ordering systems, and implementing JIT deliveries and consigned stock where possible. Total Pell-Q inventory at Basco sites ran into several tens of millions of dollars; Pellton expected the safety stock reduction from SKU rationalization to offset their additional inventory burden from consignment.

Organizational awkwardness, and failed implementation

"How shall we share the benefits?" Although the implicit assumption had been that both sides should gain, no explicit agreements had been made. When Pellton's logistics manager raised the issue, the Basco Purchasing chemicals purchasing director responded by saying "let's focus on opportunities first and make sure there are benefits, then we can talk later about how to share". Six weeks after their first meeting, the team agreed that implementation at all Basco sites should be completed within half a year, by January 1, 1995.

Planning the roll-out in a decentralized organization. During subsequent meetings, it became clear that Basco was highly decentralized, and corporate headquarters could not simply impose new ideas on the plants. Their assistant technical director confirmed that "logistics processes vary enormously between sites within Basco and there is in most cases a disconnect between Pell-Q ordering and production planning and possibly even between production planning and sales". Eventually, the team decided to go ahead with SKU rationalization at all sites by year end, but to work on increasing forecasting accuracy on a site-by-site basis. The idea was that consigned stock would be implemented only after forecasting had been improved, to provide Basco with the incentive they said they needed.

Implementation delayed. By December 1994 the team had decided to start with a three-month pilot of SKU rationalization and consignment at a single site at their Antwerp, Belgium, plant; when successful, the project would be rolled out to the others. The pilot site was represented by the local logistics manager (the converted sceptic). To Pellton, it was still unclear exactly what his position was; "certainly in our early meetings with them, it was difficult to tell how much authority he had to implement changes. Our first couple of meetings at the Antwerp plant, we weren't even allowed out of the conference room, I don't know what he was afraid of."

Implementation almost derailed. When the Pellton sales representative responsible for the Basco Antwerp account was pulled onto the project team, he was surprised to find that the plant manager had not been involved so far. In April 1995, just after the pilot had started, he and a Pellton logistics engineer visited the Antwerp plant manager to explain the projects taking place and to discuss the proposal for an EDI link. Though not really enthusiastic, the plant manager agreed to study the project. However, the next day he opposed the EDI link in a meeting with the Basco steering team members. They, in turn, were upset that Pellton had acted without them. The tensions were soothed, but Pellton's sales rep concluded that "we underestimated the complexity of Basco internal communication and politics. In future, we have to try to refer to the Basco Purchasing chemicals purchasing director on everything."

Forecast accuracy was not good enough. The pilot had started on April 1, 1995. The SKU count was duly reduced, and Pellton took on ownership of Pell-Q inventory at the pilot site. Pellton replenished the consigned stock weekly, based on daily consumption data and weekly forecasts for the next three weeks. The agreement was that the consigned stock would cover the Antwerp plant's forecast needs for the next two weeks. When the pilot was evaluated after three months, the level of consigned stock had not decreased. Actual requirements frequently deviated substantially from the forecasts on which deliveries were based. Pellton staff remembered that they had recognized early on the need to give Basco an incentive to produce good forecasts, but they had let the issue slip. They presumed Basco also needed to gain confidence in Pellton's ability to deliver reliably and responsively before feeling happy with a much lower stock.

Back to the drawing board

Putting the roll-out on hold. In a joint evaluation meeting in July 1995, Pellton announced they would not implement consigned stock at other sites until pilot site stock had decreased. Upon hearing the current stock levels, the Antwerp plant manager exclaimed "that's ridiculous, we don't need that much", and vowed to bring stock down. The steering team decided to map information flows from Basco Antwerp's customers back to Pellton, to design a better, more integrated planning and forecasting process making use of EDI.

Mapping the current process. To help with EDI, Pellton added an IT project manager to the team. They visited Basco Antwerp and another Basco plant and mapped information flows. The Basco team members (now including the Antwerp plant manager) were remarkably open; the Pellton team learnt a lot about Basco's physical process and planning procedures. Interestingly, during the mapping at the second site, the local logistics manager was amazed when he saw just how backward their own planning systems were. For instance, the planning systems at Basco were largely manual and paper-based; information was aggregated before being sent to Pellton, who would then guess how to disaggregate it for planning deliveries.

Designing the future process. The team met a month later to design a new integrated planning and forecasting system. Pellton would now receive all relevant information in the form of forecasts or updates as quickly and in as much detail as possible, and the Basco sites would get more visibility on Pell-Q stock available to them. Ideally, Pellton would like to see all EDI orders from Basco's customers, but the Basco team members explained that that information would not really help Pellton plan production and would tell them too much about the market.

Preparing for EDI. Soon after, the Pellton IT person returned to Antwerp to meet the local IT staff. Although Basco had sophisticated EDI links with its automotive customers, nothing similar was in place with suppliers, nor did that seem a high priority for the IT staff. Even setting up e-mail connections within the team took a long time, the Pellton IT person having to make up for the lack of IT support within Basco. Gradually, the role of the IT person extended to overall project manager, keeping track of responsibilities etc., though the logistics manager remained Pellton project sponsor.

Success at last . . .

Getting joint management approval for the roll-out. By November 1995, stock at Basco Antwerp had decreased to the target level. The project team presented the proposed integrated planning system to joint senior management, who approved implementation at the two selected sites; soon after, Basco finally decided to roll out to the remaining sites. These were generally enthusiastic, no doubt due in part to the strong advocacy by the Antwerp plant manager. The Basco Purchasing managing director took the opportunity to say they were "extremely pleased" with their cooperation with Pellton, that relations between them had improved enormously, and that he now wanted to follow a similar process within other divisions of Basco.

Perdirelli (Case 2): a short-cut to success

Perdirelli: background

Perdirelli also going through re-engineering. Perdirelli is Pellton's second largest customer, with production sites in Milan, Italy, and elsewhere; the plants are fairly autonomous. Relations between Pellton and Perdirelli, organizational and personal, had generally been relatively good. In early 1995 Perdirelli's Milan plant also embarked on a re-engineering project; senior managers at both firms agreed that would be a good opportunity to jointly evaluate their supply-chain logistics. Aided by Perdirelli Milan's re-engineering consultants and implicitly drawing on Pellton's experience so far with Basco, a project plan was drawn up. Senior managers agreed that, in principle, costs and benefits would be shared 50-50, thus allowing the lower-level design team to focus on logistics issues while leaving commercial matters to others.

Switching to a standard product formulation. Perdirelli Milan took a non-standard formulation of Pell-Q unique to them, adding to production, inventory and logistics complexity for Pellton. In the past, various unsuccessful attempts had been made to switch to Pellton's standard formulation. This project was seen partly as a way to help Perdirelli Milan make the change.

Mapping the "as-is" supply chain

Getting a design team together. Given the business re-engineering turmoil in Milan, it was not obvious who should be on the design team, as their staff were already stretched to (or beyond)

their limits. Eventually, a member of their core re-engineering team was dispatched, and a former plant manager, retired just a few months previously, was recalled to assist during the workshops, though he would not be involved any further. He had been at the plant for over 20 years, and had often been involved in purchasing during that period. Additionally, Perdirelli Milan asked one of their re-engineering consultants to facilitate the joint workshops. For Pellton the choice of team members was easier: the logistics manager who was also the key player in the Basco project, the local sales correspondent, and their plant manager.

Two workshops in quick succession. The project started with two two-day workshops, a week apart, in March 1995. The first, in Milan, kicked off with an outline of the process to be followed for the entire project. The rest of the time was largely devoted to "as-is" mapping of physical and information flows, and a first cut at identifying improvement opportunities. The maps were validated and opportunities evaluated in more detail before the second workshop, in which the "to-be" supply chain was designed and implementation planned; that included designating who would be on the implementation team. The proposals included SKU rationalization (to the same standard sizes as with Basco), consignment stock, with an EDI link to support it, and a new effort to help Perdirelli Milan switch to Pellton's standard formulation.

A handover, and another handover

Joint management approval followed soon. Two months later the opportunities had been validated and a more detailed implementation plan drawn up. The team presented their work to joint Pellton - Perdirelli Milan management, who approved the proposals. The Perdirelli Milan implementation team included the current production manager as team leader.

Implementation team disintegrated. During the Summer months the re-engineering storm really struck. Many Perdirelli Milan staff, including the entire implementation team except the production manager, were re-assigned. Fortunately their managing director had been instrumental in initiating the project and insisted that it continue; he saw it as an opportunity to learn how to do such projects with other suppliers in future, not as a one-off logistics project. He gave it high priority and visibility within Perdirelli Milan and made sure enough resources were available despite the ongoing re-engineering. By September the production manager had selected a new team, consisting of a business planner in a newly formed supply-chain management group,

the Pell-Q purchasing manager, a development engineer, and an IT expert. He gave the team a brief introduction to the project, with the documentation and plans from the design team.

The business planner became project manager. The production manager retained responsibility for the project and had the authority to ensure resource availability, but the business planner looked after day-to-day project management and documentation. He started by redefining the original implementation plan to fit the new team. The team members spent a month to get started and to review the opportunities identified by the design team, as they did not always understand the background of certain decisions or plans.

Back on the road, the project advanced rapidly

The project recovers quickly after a price increase. The Perdirelli Milan team was largely up to speed by October 1995. Meanwhile, Pellton had had their hands full dealing with the failure of the Basco Antwerp pilot. Just as the two sides were to restart the project, Pellton's sales department announced a price increase. Perdirelli Milan was naturally upset and threatened to stop doing business with Pellton; however they insisted that the project should continue regardless. An emergency commercial meeting settled the price issue. In November 1995 the two new teams met for the first time; Pellton had now added the logistics engineer and IT project manager from the Basco project. The meeting was a success and a long list of action points agreed on. For both sides the project would require substantial changes to their IT systems. Implementation was planned for March 1, 1996, starting with a one-month trial period during which the old and new systems would run in parallel.

A joint project manager to speed up the project. By late February it was becoming clear to the Pellton team that they could not meet the deadline for the IT changes. They confessed this to their counterparts in Milan, who admitted to having similar problems. During an emergency meeting Perdirelli Milan's production manager suggested a joint project manager, overseeing developments on both sides, to speed things up. For that role, he proposed Pellton's IT project manager who, as a result, was given direct authority over the IT resources in Milan. A few weeks later than initially planned, the new system was in place and is now operating successfully. Moreover, with Pellton's assistance, Perdirelli Milan has decided to switch to the standard Pell-Q formulation, which would lead to significant mutual benefits, including

inventory reduction due to product standardization, and headcount reductions in purchasing. Perdirelli also want to follow a similar process with their other sites.

Analysis of the cases

What can we learn from these two cases?

Mutual benefits? Table 1 summarizes the main benefits obtained by Pellton, Basco and Perdirelli Milan. Although their exact magnitude is hard to pin down, all parties involved did consider the projects successful, and worth pursuing with other suppliers and customers. Therefore, the learnings one can extract from the two cases are valuable for future projects. To structure our analysis, we will discuss which problems were encountered, and for each of these why it occurred, how it was fixed, and what key learning this points to.

Preparation of a joint supply chain improvement (JoSCI) project

Need to agree on a process upfront. Especially in the early stages of the Basco project neither side had a clear idea of how to organize it, which activities to undertake, in which sequence, etc. This occurred because the team had not started out by defining a process to follow. The first step of the Perdirelli Milan project was to jointly agree on a process, which underlies the "roadmap" in the next section. As a result, the Perdirelli Milan project was far smoother (though it failed to deliver commercial success for Pellton). In addition, being able to describe the full process upfront has helped Pellton overcome scepticism in initial discussions with other customers, who were afraid a JoSCI project would be "yet another initiative that would never go anywhere". From this one sees the importance of simply having a process to follow, be it the one proposed here or another such as that in Byrnes and Shapiro (1991) or a re-engineering methodology as eg. that by Kodak (see Institute of Industrial Engineers, 1994) or "Rapid Re" (see Manganelli and Klein, 1994).

How to share the benefits? At several points early on in the Basco project, team members were more concerned with how proposed changes would affect them, rather than considering the joint benefits. The Basco Antwerp logistics manager, for instance, initially had little incentive to

cooperate. This can be explained by the benefit sharing agreement, or rather, the lack of it. The mandate given to the Pellton - Perdirelli Milan design team was explicitly to search for *joint* improvements and to leave commercial issues of sharing costs and benefits to senior management. In principle this would be on a 50-50 basis; though this may be difficult to realize exactly in practice, it does clearly establish the goal of joint optimization. This allowed Perdirelli Milan to consider making the technical changes necessary to switch to Pellton's standard product formulation, knowing that both sides would benefit. From this one learns the importance of separating logistics and commercial issues and of agreeing on a joint-optimization-oriented sharing rule. Byrnes and Shapiro (1991, p. 21) found that the benefit sharing rule often evolves over time, with the customer initially often taking the lion's share but the vendor standing to gain as more customers adopt the new mode of operating and sales increase.

Functional representation on team. The IT-related projects agreed upon in the second Pellton - Basco workshop eventually petered out; as no IT staff had been involved they had not been thought through carefully enough. With Perdirelli Milan, IT staff from both sides joined the team much earlier. This is especially sensible as IT is frequently an important enabler in redesign (Davenport, 1993). Similarly, the Basco Antwerp plant manager almost killed the project when he was finally informed, but turned into a staunch supporter after having been involved for some time. It was the Pellton sales rep who had recommended his involvement, but he himself had not been pulled onto the team until late. The Basco Antwerp logistics manager who had been involved from the start seemed to lack the authority to agree to any changes. By contrast, the Perdirelli Milan production manager was involved at an early stage and provided strong support throughout. This points out the importance of having the appropriate functions and levels involved early in the project.

Project sponsors. Few resources (such as IT support) were made available within Basco; the Basco Purchasing chemicals purchasing director was their key player, but Pell-Q was by no means his only concern, and he had no direct authority over the production sites. A high-level project sponsor was lacking, in contrast to the Perdirelli Milan case where the managing director and production manager removed resource constraints and carried the project through potentially disrupting periods such as the double handover, Perdirelli Milan's redesign program, and the price increase.

From mapping to analysis and design to implementation

"As-is" mapping. The failure of the Basco Antwerp pilot was due, in part, to poor understanding (on both sides) of current ordering, forecasting and planning processes. The information mapping was a true revelation for all concerned, and eliminated many inefficient practices. The Perdirelli Milan project started with mapping exercises, thus avoiding such surprises and resulting time delays during implementation. The importance of mapping is also recognized by Byrnes and Shapiro (1991) and the Institute of Industrial Engineers (1994). Additional, intangible but critical benefits of mapping lie in team building: it helps members replace typical individualistic perspectives by a system-wide one, a key message in Senge (1990).

Analysis and redesign. In the Basco project the team initially had little idea how to search for improvements. Unrealistic expectations of inventory savings resulted from poor understanding of the true causes of stock. This, in turn, was caused by the team's not knowing which tools to use. The quality control literature offers many suggestions for analysis; for instance, in a later project a fishbone chart (or Ishikawa diagram) was constructed for analysis of root causes of excessive inventories. Though often cast in redesign terms, the JoSCI projects so far were more geared toward continuous improvement, or streamlining the supply chain. Joint (radical) redesign is not impossible, but places far higher requirements on the partnership than the improvement methodology discussed here. Recognizing this distinction is important for selecting the appropriate analysis and design tools (see below) and setting realistic expectations. Careful estimation and measurement of benefits was not performed in either of these cases and has led to problems; Byrnes and Shapiro (1991) point out that this is crucial.

Managing the project. We have seen that progress in the Basco project was slow, deadlines were frequently extended, implementation and roll-out repeatedly delayed. One major contributory factor was the project management style: generally loose, with no tight deadlines or follow-up. The Perdirelli Milan project was managed more tightly throughout, especially when the new implementation team got started. Deadlines were tight (once even slightly too tight), and project managers on both sides followed up on all activities. This resulted in the Perdirelli Milan project being executed much faster (even though it was commercially less successful), which illustrates that appropriate project management is as important here as in any other project.

A roadmap for supply-chain streamlining projects

The roadmap

A roadmap based on key learnings above. Pulling together the critical factors identified in the previous section and combining them with existing literature, we construct the practical roadmap shown in Figure 3, suggesting step by step how JoSCI projects should be managed. The sequence is broadly similar to Byrnes and Shapiro's (1991) "awareness, orientation, implementation" and the Institute of Industrial Engineers' (1994) "project initiation, process understanding, new process design, business transition, change management", but we aim to provide a more detailed and operational roadmap here. The key lessons from the cases relate to the preparation stage, which is what we focus on; of course, project management and implementation are also critical but these are already widely discussed elsewhere.

Preparation

Team composition. Many factors need to be balanced here:

1. *Team size.* The first workshops with Basco included close to 20 people which was unwieldy and suggests a lack of focus in project scope. The Pellton - Perdirelli Milan team had between two and five people from either side, and worked relatively well.
2. *Functional representation.* Typical functions to include are logistics, sales/purchasing, production, and IT, all preferably from the very beginning of the project.
3. *Knowledge.* Especially during the mapping exercises and subsequent analysis, people with detailed knowledge of current processes need to be involved. Administrative sales and purchasing staff will know order volumes, patterns and procedures; sales reps and purchasing managers may be more aware of organizational issues within the other firm.
4. *Authority.* The project team should include people who can authorize changes suggested by the team, such as the Basco Antwerp pilot site plant manager and the Perdirelli Milan production manager.
5. *Team roles.* Various roles are needed in a team:
   - *Project sponsors,* senior managers to get the necessary resources and to authorize whatever changes are needed.

- *Team leaders,* with accountability for team performance, with their own authority or invested with that of a sponsor.
- *Project managers,* responsible for following up and documenting the project plan.
- *Facilitation* of the workshops was sometimes done by consultants but later by team members. The facilitation role may be separate from the other team roles.

6. *Minimizing handover problems.* In general, three groups of people are concerned: design team, implementation team, and process owners (the people performing the work being redesigned). Ideally, the overlap between these three groups should be maximized. When handovers cannot be avoided, as with Perdirelli Milan, they should be managed carefully to avoid problems of acceptance and understanding, such as the not-invented-here syndrome (Allen, 1977).

Team selection and management are also discussed extensively in Lynch and Werner (1992).

The first workshop: "as-is" mapping

Setting directions, and mapping. The primary goal of the first workshop is to establish directions for improvements and to map the current supply chain (the "as-is" mapping). A second critical aspect is team-building: it is the first occasion at which the team members from both companies sit together, and soon after they need to be working as a "one-company" team.

Understanding customer needs. A good understanding of customer needs is required to guide the search for opportunities. These will be very different depending on eg. whether the customer competes primarily on low cost or on flexible response. Bowersox and Daugherty (1995) discuss how internal and external logistics structure should depend on the firms' strategic orientation. This is also central to Hammer and Champy's (1993) re-engineering principles: each process has a customer, and should be designed to meet that customer's needs. Note that this analysis should start from the *final* customer's needs, as the process is aimed towards making the entire supply chain meet those needs more effectively.

Supply-chain mapping procedure. Often, separate maps are drawn for physical flows and for planning and information flows. A plant tour helps to visualize the physical process being mapped. A major challenge in mapping is ensuring the right level of detail throughout; mapping exercises often stay at too high and abstract a level, but time constraints will rule out too much

detail. Breaking the process down into key subprocesses (eg. forecasting, production planning, scheduling, order picking, etc.) and then tackling these one by one has worked well. To induce a critical mindset, mapping each process "backwards" can help. Discussions of mapping with examples are given in Lynch and Werner (1992) and Manganelli and Klein (1994). The exact procedure is not as important as capturing the relevant information. As handovers between people often point to opportunities, time-function diagrams are appropriate. During the mapping, one person will actually draw the map (on a large sheet of paper, legible for the entire team); others should be capturing opportunities that come up and other relevant comments. Responsibility to follow up on these should be assigned by the end of the first workshop.

Analysis and "to-be" process design

Streamlining or redesign? Probably the most important step in the entire process, this is where the supply chain is actually streamlined or redesigned. In either case, value-added analysis is useful. Three criteria must be met for an activity to be value-added: 1) the customer cares about it; 2) it transforms the product or brings it closer to the point of use; 3) it is done right first time. Lynch and Werner (1992) discuss many practical tools to use in a continuous improvement situation. Redesign, starting from a clean sheet of paper, is potentially more rewarding but also places much higher demands on the customer relationship.

Streamlining: look at re-engineering literature. Before this step, targets should have been set, based on customer needs uncovered earlier. Performance of the current supply chain along those targets and the gap with target levels required should be measured. Key performance indicators should be decided on, to answer the question "What will tell us if a change is an improvement?" The design step should then focus on meeting those needs on a routine basis, and dealing with exceptions or contingencies separately. Points to focus on in streamlining are eg. performing sequential activities in parallel, batching and other causes of inventories, and responsibilities for each process step. Harrington (1991) addresses these issues in more detail.

Redesign: "does this add value?" Rather than stick to the as-is map and move or delete process steps, true redesign starts with a clean sheet of paper. The challenge is to construct a new supply chain using only the value-added activities; creativity will be a key asset. Ideally, a redesign team should be at least partly different from that during the as-is mapping, to provide the

necessary fresh perspective. Though redesign may be difficult in practice, most principles remain valid for streamlining: a vision of an ideal supply chain is always useful as a target to work towards. Going through a redesign exercise will often bring to light many assumptions underlying the current supply chain which are no longer valid, eg. due to advances in IT. General redesign principles can be found in Hammer and Champy (1993), Davenport (1993) and Harrison and Loch (1996).

The second workshop: "to-be" mapping

"To-be mapping". As truly joint "to-be" design is impractical due to time constraints, the approach taken so far is for Pellton to prepare a proposal, if possible involving the customer, and then discussing it during the second workshop. Important steps are to check whether the to-be supply chain will deliver the target improvements, identifying the implementation team and carefully planning the handover (if any) and quantifying the resources needed.

Management review

Getting the green light. In both projects the design team had to defer to senior joint management for approval to implement their proposals. Organizing this management review as a presentation by the entire team (not distinguishing between Pellton team members and customer team members) to joint senior management reinforced the team-building effect. Senior management will generally have to decide on how to actually share the benefits, an issue the design team did not address other than by providing information necessary for the discussion.

Implementation

Change management and project management. Once implementation approval was given the Perdirelli Milan project shifted into a different mode; the Basco project continued to be loosely managed throughout. Clear senior management support will help overcome typical problems of resistance to change. Early involvement of the implementation team should reduce resistance associated with the not-invented-here syndrome (see Allen 1977, and remember the Basco pilot site plant manager); keeping a log of when and why decisions were made will help integrate new team members such as the Pellton sales rep for Basco Antwerp and the new Perdirelli Milan

implementation team, and is also an important step in learning for future projects. IT support for e-mail links can enable appropriate communication, both formal and informal, within the team. Change management and project management are extensively discussed in the literature, see e.g. Meredith and Mantel (1985) or Cleland and King (1988).

Continuous improvement

The roadmap so far provides a way to achieve an initial supply-chain improvement. By opening more communication channels between Pellton and their customers, it should also be a basis for continuous improvement rather than a one-off project.

Integration of the JoSCI framework within the organizations

The JoSCI process is clearly time-consuming, and in order to implement it with multiple customers, more than one team is needed. Below we outline the training program developed and used within Pellton to prepare people throughout their world-wide organization to participate in such teams. To oversee this and to facilitate exchange of learnings, a coordination structure is needed. Moreover, the link between logistics improvement and commercial issues as benefit sharing should not be forgotten. The commercial benefits for Pellton from its JoSCI effort with Perdirelli Milan never materialized, despite the project being relatively smooth, due to insufficient integration within Perdirelli's purchasing organization.

Training

Structure of the training program. To prepare others within Pellton to participate in or manage joint supply-chain improvement projects, a 2 1/2-day training program was developed, based on more detailed versions of the Basco and Perdirelli case studies and the roadmap and supplemental documentation. An additional day can be reserved for facilitation skills training, to prepare participants for being team members or leaders. Participants are drawn primarily from sales, logistics, production, and IT. The training begins with a distribution game (the "beer game", see Senge, 1990), to make participants understand why supply-chain improvement projects are needed, and to serve as a vehicle for discussing the Pellton supply chain. A

presentation of how the JoSCI process fits within Pellton's strategy follows. Next is a discussion of the Basco and Perdirelli cases, to bring out a number of logistics issues (eg. SKU rationalization, consignment stock). A first comparison of the projects introduces the key issues in the JoSCI roadmap. Then, after a brief preview of the roadmap itself, its key stages are discussed one by one in participant-facilitated sessions, drawing on the documentation and the two cases; mapping and redesign are done in group exercises. Lectures on topics as supply-chain management, business process re-engineering, time-based competition, etc. are injected where appropriate. The training concludes with a summary of the roadmap itself.

Style of the training program. The guiding philosophy behind the training was to let participants undergo the same learning process as the Pellton logistics manager and we did while developing the roadmap. The participants should not only know the "how", but particularly the "why" behind it. The program is designed to address a variation of learning styles, including case discussions, lectures, games, group exercises, and participant-facilitated discussions. The latter are included as facilitation skills were found to be important; participants practice facilitating supply-chain improvement workshops by facilitating the discussion of the key stages.

First experiences with the training program. Most of the first group of participants had been involved in the Basco or Perdirelli cases; a second training was conducted three months later. Feedback was generally positive (the main criticism was related to the facilitation training), and only minor changes in content were called for. Pellton intends to run the training throughout their organization, approximately six more times world-wide, to support applying the roadmap with many of their larger customers. More recently, a combined training/mapping workshop was held jointly with a customer. In fact, this supply-chain improvement process is now considered a key ingredient of Pellton's competitive strategy.

Coordination structure

Need for a superstructure. With half a dozen or considerably more supply-chain improvement projects running in parallel world-wide, a more formal coordination structure is needed. This has a number of reasons: selection of customers and ensuring resource availability within Pellton becomes more complex; projects with different customers should not move in conflicting directions; and learnings from projects must be captured and embodied in the process roadmap.

A critical element of this superstructure will be to implement a performance measurement system to monitor the supply-chain improvements achieved, eg. resulting cost savings and market share increases, but also project performance itself, ie. project duration, resources consumed, etc. Also necessary for capturing learnings is a systematic project audit, as Clark and Wheelwright (1993) propose for new product development projects.

Reaping the commercial benefits

The JoSCI project with Perdirelli Milan was smooth precisely because it was almost entirely performed at the plant level within Perdirelli. Unfortunately for Pellton, though, when the next round of commercial negotiations started with Perdirelli's central purchasing group, the latter had hardly been involved in the JoSCI project and accordingly placed little value on Pellton's efforts, demanding a price decrease instead. In the event, Pellton was unable to convert its JoSCI investment into increased volume or reduced price pressure with Perdirelli.

With Basco, the opposite pattern emerges: initial progress was slowed because everything was done through the Basco Purchasing purchasing group rather than directly with the plants. However, the result was that Basco Purchasing did see the value of Pellton's JoSCI initiative and honoured this by increasing their volume. The conclusion is clear: for *project success*, direct contact with plant-level staff is essential, but to convert this into *commercial success*, the customer's purchasing group must be involved throughout too.

Conclusions

So what does a supplier need to do in order to improve supply-chain efficiency jointly with customers and move closer towards a true partnership with them, while obtaining commercial benefits such as increased market share or reduced price pressure from doing so? We have described two projects in which a supplier attempted to improve relations with key customers. Comparing the two cases, we derived critical factors for such projects, and integrated these into a joint supply-chain improvement framework. This can also be seen as a tentative roadmap of a practical process allowing firms currently in a more arm's-length relationship to jointly improve supply-chain logistics, and to move closer towards a true partnership in doing so.

The roadmap in Figure 3 outlines the critical steps in a supply-chain improvement project. At a deeper level, it simultaneously is designed to start from an arm's-length relationship and to build trust within the team as the project proceeds, moving the companies closer to a true partnership. We found that composition of the project team is critical and non-trivial, and that starting a project with a careful mapping of the current supply chain was important, as a basis for improvement but also for team-building. Also, just having such a roadmap already facilitated projects considerably. The roadmap has been implemented and tested within Pellton with several subsequent JoSCI projects world-wide. We also found that coordinating multiple parallel JoSCI projects and converting suppliers' efforts into commercial benefits requires careful integration of the JoSCI process within the respective organizations.

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Figure 1. Pellton International Supplies to Automotive Suppliers

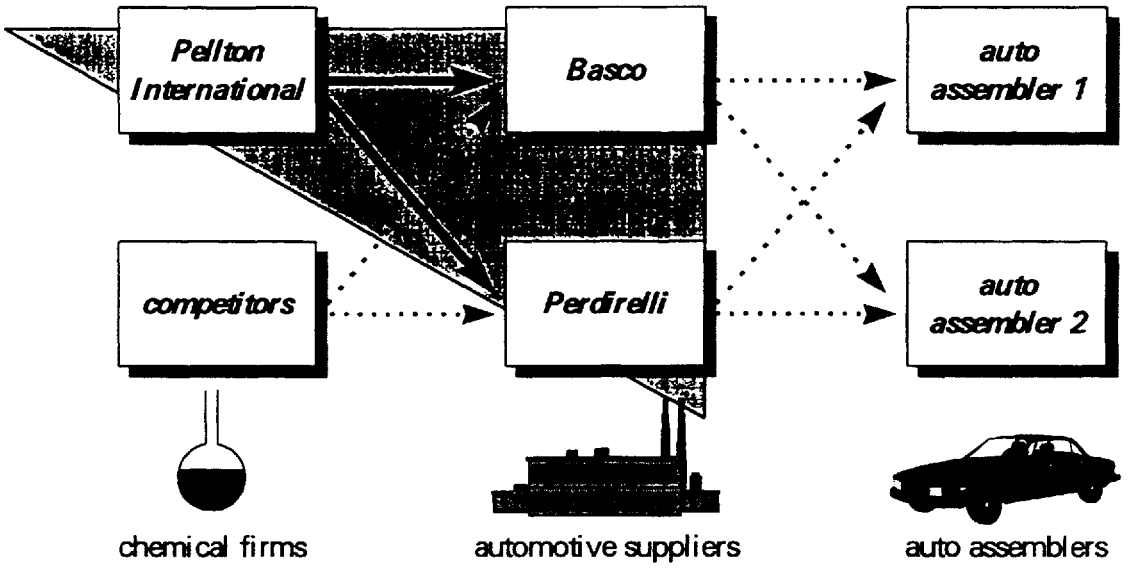

Figure 2. Chronology of Joint Supply-chain Improvement Projects with Basco and Perdirelli

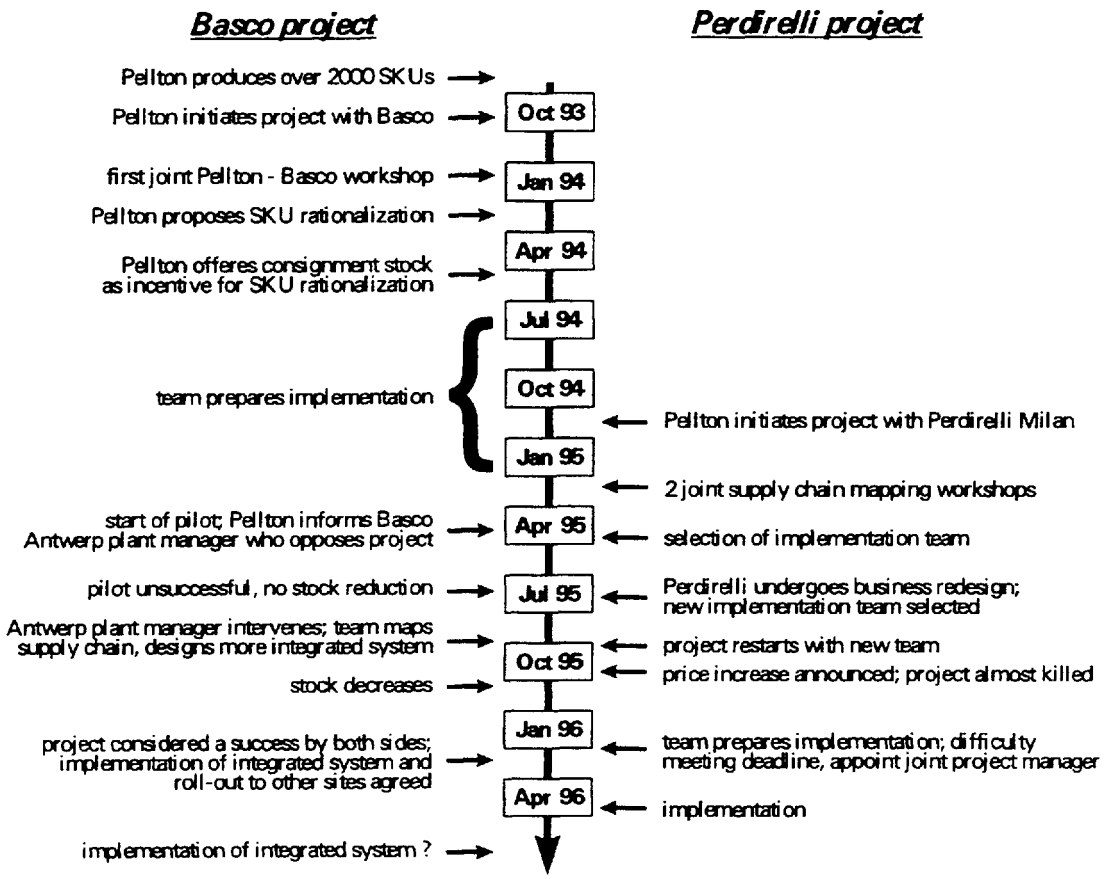

Figure 3. Roadmap for Joint Supply-chain Improvement (JoSCI) Projects

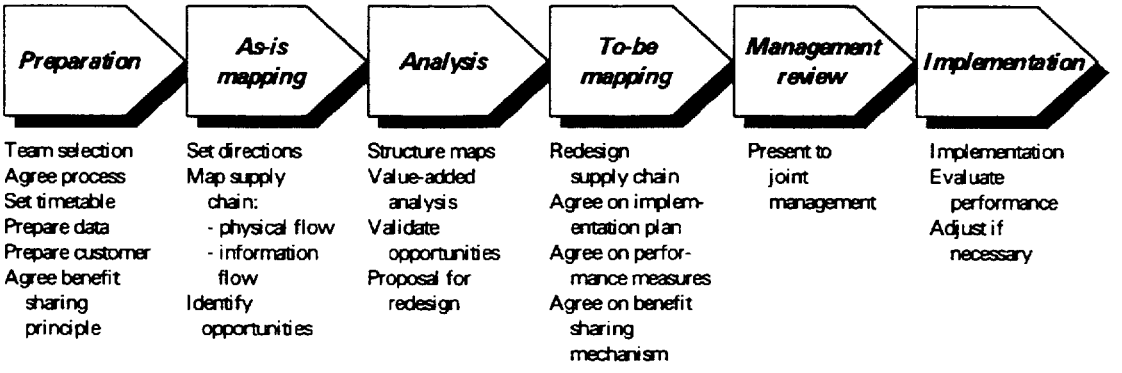

Table 1. Benefits achieved from JoSCI projects.

Pellton International	*Basco Antwerp*	*Perdirelli Milan*
• Radically improved relationship with key customer Basco, and have become preferred supplier • Projected elimination of unique product formulation for Perdirelli Milan, reduced safety stocks and scheduling complexity • SKU rationalization: potential for substantial safety stock reduction (if followed by enough other customers) • Better visibility on demand from Basco Antwerp allows keeping lower safety stock and helps prevent rush orders	• Consignment stock: eliminated millions of dollars of inventory • Potentially more reliable deliveries due to integrated planning and forecasting system	• Partial consignment stock: reduced safety stocks • Reduced headcount in ordering • Learnt about JoSCI process, plan to apply with other suppliers

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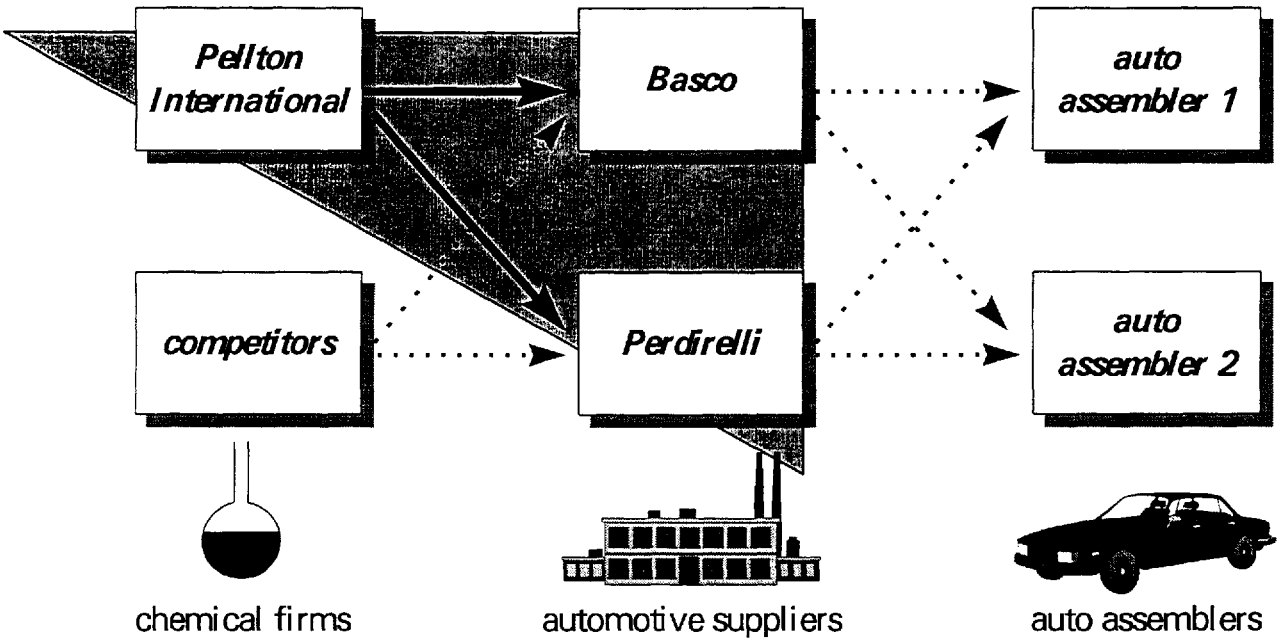

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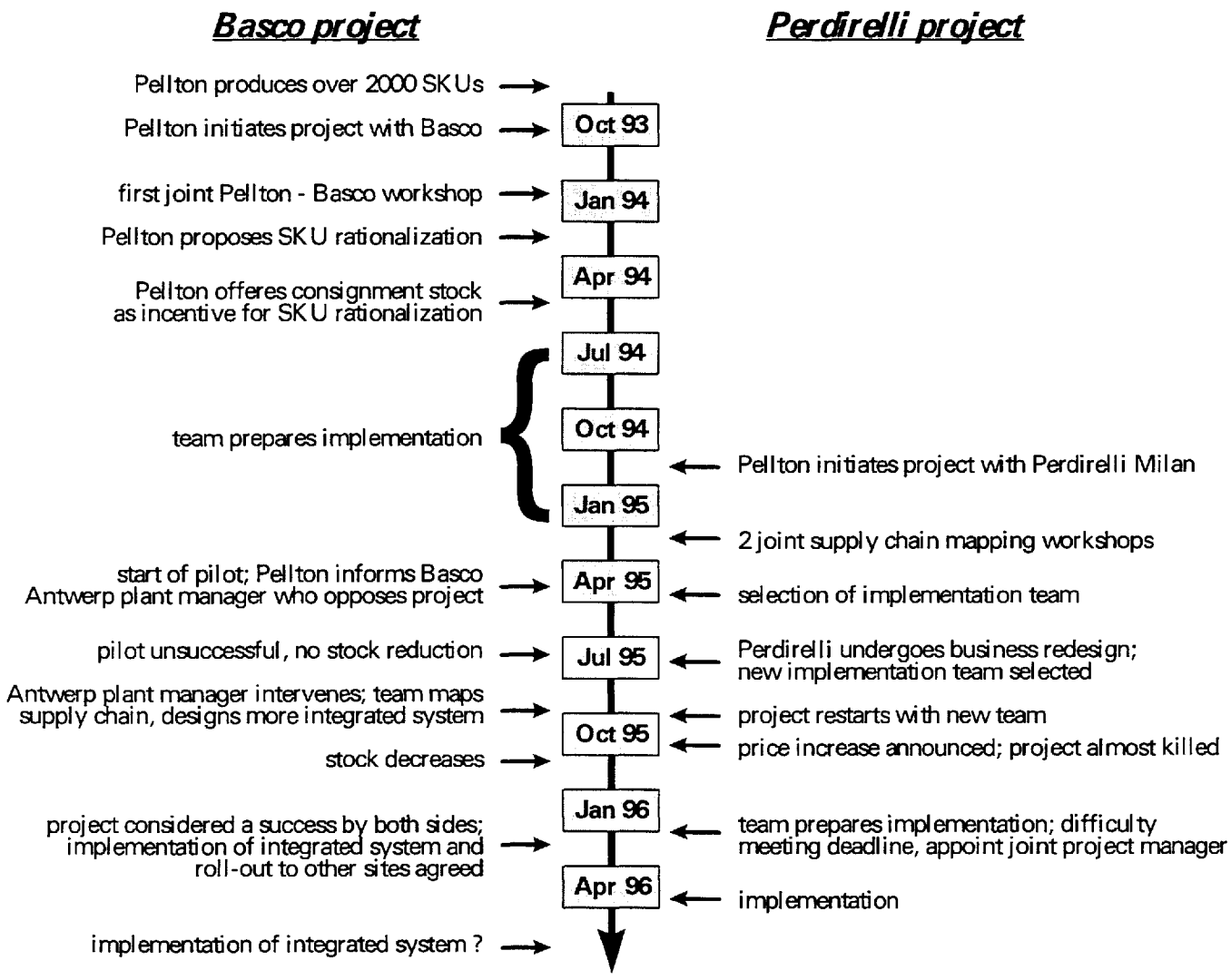

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