

**"PRODUCT DEVELOPMENT IN
THE TEXTILE MACHINERY INDUSTRY"**

by

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Printed at INSEAD,
Fontainebleau, France

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I thank the participants who attended the conference "Competitive Product Development: Implications for Strategy, Technology and Organization" held at the Euro-Asia Centre, Fontainebleau, as well as Kenneth Bonheure, for their valuable comments and suggestions for improving this paper.

ABSTRACT

The textile machinery industry is a highly concentrated industry. In particular, the design and production of textile looms is carried out by a limited number of companies. The textile loom has undergone a series of dramatic technological improvements and during the last thirty years we have seen the development and introduction of projectile machines, rapier machines, airjet and waterjet looms from a simple shuttle loom. From a purely mechanical construction the textile loom has become a complicated machine which uses aerodynamics, materials science and electronic controls. It can be considered to be an example of a relatively sophisticated numerically controlled machine.

The customers for these machines are extremely competitive. Each of the textile loom producers has to provide a relatively complete range of machines to compete for orders. The market is global with the major textile loom producers confronting each other for almost every big order. Very few of them have a truly captive market and as a consequence their machines are constantly compared by sophisticated buyers with clear performance specifications.

Through interviews we have gathered data on the product development process as well as the *development/production interface* in five of these companies. What started as a comparison between Japanese and European companies turned out very quickly to be a comparison of management techniques amongst groups of companies for which the dividing lines do not coincide with geographical location. We studied in particular for this paper the issue of development philosophy, the organisation of the development laboratory, and the differences in approach to the technology transfer between development and production.

Key words: product innovation, development strategy, textile looms.

INTRODUCTION

The product development process is one of the most widely studied activities in the firm. We should not be amazed by the attention paid to this process. Indeed innovation is essential for the survival of the organisation and the process through which one develops products is one of the most important operationalisations of the innovation task. Most studies focus on a particular aspect of the product development process: the management of professionals, the design of the project organisation, tools for project planning and resource allocation (Souder, 1984), the improvement of communication (Allen, 1977), design for manufacture (Susman, 1992), etc. A limited number of studies have taken a holistic view of the product development process. Most of these studies are limited to clinical case studies in one company (Burgelman and Sayles, 1986; Fruin, 1991), or a small group of companies. Only a few studies have actually gone beyond this stage and have a significant sample for a particular industry or have covered nearly the whole population (Clark and Fujimoto, 1991; Cusumano, 1985).

In this study I have attempted to take a holistic view. If one looks at the product development process in one particular industry, what are the differences and commonalities between the different companies competing with each other? And can these differences and commonalities explain the differences in performance between the companies?

In order to have a significant sample--it is probably impossible to obtain a complete population--and to be able at the same time to have an in-depth analysis of the product development process, I decided to choose an industry with a limited number of products, and with a limited number of competitors. On the other hand one did not want to study an oligopolistic industry. Only the results for a competitive industry would provide insights which can be generalised to other relevant industries. It turned out that I found a good domain of study in the development and production of textile looms.

In this paper I will give a progress report after having studied five companies. The results section will focus on three aspects: the design philosophy, the organisation of the design department, and the shortening of design cycle times.

1. Short Description of the forces in the industry

Textile looms are machines which date back to a very early period in man's history. Manual shuttle looms have been in use for thousands of years. The first mechanical shuttle loom was developed at the end of the eighteenth century in the United Kingdom. Continuous improvements in the mechanical design allowed higher speeds, improved fabric quality and thus higher productivity. The maximum speed of a shuttle loom is determined by the inertia forces which play a role in the slowing down of the shuttle, the reversal of its movement, and the speeding up of the shuttle. These inertia forces create vibrations. Above a certain speed of fabric production it becomes uneconomical to construct a frame that can withstand these vibrations. Consequently there has been a constant search for alternatives to the shuttle for carrying the thread. A wide range of possibilities were patented in the history, but only since the beginning of the sixties can one observe practical applications of these alternative ways for transporting the thread.

In the beginning of the sixties, the Sulzer company introduced a small lightweight projectile to transport the thread. In the seventies, rapier looms, airjet and waterjet looms were developed. Rapier looms consist of two rapiers which hand over the thread in the middle of the fabric. This way the frame is subject to two symmetrical forces, and the rapier has to travel only half of the distance. In airjet and waterjet machines the thread is transported by air or water. Waterjets are obviously only useful for yarns that do not absorb water. In both cases there are serious risks for high energy consumption. A good construction of the machine requires a good understanding of hydro- or aero-dynamics.

In more recent years weaving looms have increasingly become a part of an automatically monitored and controlled comprehensive textile process. Programming of the fabric production, automatic pick-finding, color and pattern correction during the weaving, bi-directional communication with host computers, preventive maintenance analysis, etc., have all led to an increase in the importance of the intelligent microprocessor-based control systems on the textile loom.

In summary, one can say that for about the last thirty years the textile loom has evolved from a relatively stable mechanical construction to a sophisticated numerically-controlled machine combining aero- and hydro-dynamics, electronic control, mechanical construction and materials sciences.

The market for textile looms is a global one. Apart from some small textile producers which may provide a captive market and a testing ground for some of the textile loom producers, most of the looms are sold to sophisticated textile mills all over the world. The total market for these sophisticated textile looms in the non-communist world was estimated in 1989 to be around 23 000 machines. The total world market in 1989 for weaving machines was estimated by the International Textile Machinery Federation (ITMF) to be ca. 63 000. The number of machines sold each year remained relatively stable over the last five years. The changeover to shuttleless weaving machines has enabled such a significant increase in performance that even with the rise in the production of woven fabrics, the number of machines installed worldwide has hardly changed so far. The customers for textile looms are often large companies which will make a serious investment analysis of the products they are offered, and the market is a fairly efficient one. Though each of the remaining textile loom producers may have some captive niche markets, their machines are constantly compared. In order to survive they must remain more or less at par with their competitors.

Selling a set of ten or hundreds of textile looms is obviously based on more than the intrinsic quality of the machine and its price. Financial packages, after-sales service networks, payment conditions, and other elements which are not directly related to the machine performance play an important role. Yet one could argue that the fact that a machine supplier survives in this market indicates that the product must be more or less at par with those of the competitors. This product is obviously a result of a product development and production process. It is this process we would like to study here.

2. Description of the population and the sample.

This study was started before the implications of the opening of Eastern Europe became clear. Consequently the study is limited to the producers from the traditional free market economies.(1)

Currently there are eight major textile loom producers left. Four of them are European, and three of them are Japanese. Besides these, there is one European-Japanese joint venture. Some of these companies belong to larger

industrial groups, such as Toyota, Nissan, Sulzer, or have had connections with a large group, such as Dornier. Other are independent producers specialised in textile machinery, such as Tsudakoma, Picanol, Vamatex. The joint venture is a construction between Toyota and Sulzer. Smaller companies such as Somet, Nuove Pignone and Ishikawa are important players in the market, but do not take a leading position in terms of product development.

Since the joint venture has only limited development activities, I decided to study the seven remaining companies. One company refused to participate in the study. Up until now five major studies have been completed.

Not all of the companies in the sample produce all types of machines. None of them still make traditional shuttle looms. All make airjets. Only two of them produce waterjets, and only four of them produce rapier looms. Three of the producers go for the mass market. Two have a slightly different positioning and emphasize somewhat more the market of machines for special applications.

In each of the companies I had long discussions with representatives from product development, production and general management. In each of the cases I visited the factory, and correspondence after the interviews helped in clarifying some of the statements.

The companies obviously know each other very well. I asked each of them to rank the different companies in terms of technical strengths and competitiveness. This ranking was somewhat biased by recent successes or failures in obtaining particular orders. But it seemed that everybody agreed that the technical differences were not that enormous. A company may have a few months of lead time in technology, but the rest will catch up quite quickly and even surpass the performance of the temporary leader. In most cases the final judgment about strength of the companies involved was determined by their relative market position.

A second way of judging the performance of the different companies which I used was the number of machines sold per year and per development employee (Table 1). Since in most, if not all major sales, textile looms have to be adapted to specific needs of the customer, this ratio can be an indication of the productivity of the product development process. One has to be careful with the interpretation of

this data since this ratio is influenced by the organisation of the development department, as well as the design philosophy of the company.

Table 1: Number of machines sold per year per development employee	
Company N°	Ratio
1	30.8
2	17
3	40.3
4	14-17.5
5	35.7-44.6

What started implicitly as a comparison between Japanese and European manufacturers turned out very quickly to be a study of a group of manufacturers, without having a national bias. Indeed it turned out that the differentiating lines for many of the characteristics of the product development process did not coincide with nationality. There was in several cases more similarity between a Japanese and a European manufacturer, than between two European manufacturers.

3. Results

3.1. Design philosophy

In each of the interviews I tried to understand what the objectives of the product development were. There was a remarkable consensus about what the ideal machine might be, and what the market expects from the product development. Though two of the five companies are somewhat more niche-oriented, they had all nearly the same description of what the customer wants. The basic requirement is to improve the productivity of the weaving process. In today's circumstances, that still means in many cases the reduction of direct labour. In that context, the increase in weaving speed remains a crucial problem. But the nature of that problem has changed. Whereas before the speed limitations were dictated by mechanical considerations, today's limitation is in the strength of the yarn. High-speed looms with speeds of 1500 rpm were shown by Tsudakoma at the 1991 ITMA trade fair, which is the most important fair in the textile industry. But in order to do so, it had to use a reinforced yarn, for which no real market applications existed at the moment. Other goals are versatility of the machine in order to increase the number of applications, reduction of energy consumption for the jetlooms, increased ease-

of-use and reduced environmental impact. In different ways each of the producers stressed the need to improve the quality of the fabric, defined as appearance and feel of the fabric. A lot of the quality problems are still related to the fact that in many cases the thread is a natural and somewhat unpredictable product.

Recent innovations emphasise automation of the environment in which the textile loom will work: automatic feed of the loom, automatic repair of the thread, and integration of several machines in local area networks. Unmanned weaving seems nevertheless a far shot in the future. Manual intervention seems to be still unavoidable. And the automated loading and unloading mechanisms appear in many cases to be gadgets rather than robust industrial machines.

If I observed a remarkable consensus about the design goals, I found two very different approaches with respect to product development philosophy. Three companies had a well formulated '**generation approach**': products are introduced in generations, which will then be further refined. In these companies I learned that the most difficult decision in the design of textile looms was that of changing the basic machine-frame. Though the extent of this change needs to be restricted as much as possible, the limits of the existing frame will be reached at some point in time. Responding to the needs of the customer or the market, i.e. adding new features, or changing the sub-assemblies, becomes increasingly difficult. At some point a new frame is needed, and defining the specifications of this frame, in order to be able to respond to the market three, five or seven years down the road, becomes a big challenge.

The companies adhering to this approach stressed the need to have a sufficiently well organised database on customer needs and on the task of weaving, and deployed methods such as 'quality function deployment' and a very well specified design process. Mastering the design process sometimes seemed to overtake the need to have a knowledge of product technologies.

But some of the loom producers recognised that changing the frame is something one does very reluctantly. There is a lot of know-how embodied in the product, know-how not only about the machine, but also about how it should be used in a textile factory. Changing the model causes a lot of this know-how to be lost. In one of the interviews it was repeatedly stressed that one simply does not know what 'one throws away when one changes the frame'. This leads us to a

second group of companies which stress that the last thing they want to do is change the frame of the machine. These companies expressed a strong belief in a process of continuous improvement. Even if a new generation of machine was announced for marketing reasons, it seemed that this new generation was a mere compilation of small improvements introduced in the machine on the basis of specific customer requests.

The know-how embedded in the existing frame is simply considered by these producers to be too important to be discarded. In cases where new features have to be introduced, these companies are prepared to compromise on the performance of the machine in order to preserve the existing frame. One of the companies actually uses the 'robust design of the frame' common to its different machines as a sales argument.

The dichotomy I suggest here is less pronounced in practice. Companies of the generation approach applied a lot of continuous improvement in the periods in between two generation changes. I observed indeed that in between two generation changes, major strides in product performance were obtained. In one particular company, I observed, for example, that the speed of weaving progressed from about 500 to 920 rpm in the life time of one generation of air jet looms. On the other hand, companies of the continuous adaptation approach did not completely reject the idea that at one time in the far future a new generation would be needed. They simply seemed to suggest that changes in the machine frame would require a quality of information flow and such an excellent documentation of the behaviour of the machine, that they simply were not ready for it. Having said this, the two attitudes towards the design process were distinctive.

The distinction can be partially explained by what the companies considered their core competence (Prahalad and Hamel, 1990). The generation approach is based on a better understanding of the design process, and of the relationship between the technical characteristics of the machine and the market requirements. The continuous adaptation approach is based on the idea that the core competence of the company is really embodied in the machine.

Such dichotomies in development and design philosophy have been observed in other studies. Clark and Fujimoto (1991) make a distinction between the emphasis placed by automobile manufacturers on product integrity versus the

quality of the components and sub-assemblies which together make a car. Textile loom manufacturers who adhere to the generation approach question, in fact, at regular intervals in time, the product integrity of the textile machine, while the manufacturers who adhere more to the continuous adaptation philosophy question and improve on the components, without actually changing the product integrity concept.

Similarly one can go back to an earlier paper by Clark and Abernathy (1984), where different types of innovations were described. They characterised innovation by two dimensions: market and technology transilience. As a consequence, they derived four types of innovation: architectural, revolutionary, regular innovation, and niche-creation. The generation approach can probably be identified by revolutionary innovation, while the continuous adaptation approach coincides with regular innovation. In both cases, the companies conserve and/or entrench the existing market linkages, but either disrupt and render obsolete (i.e. revolutionise), or conserve and entrench existing technical competence.

I could observe a second dichotomy in the small sample of five companies. This dichotomy concerns the **innovation focus**: what is the major driving force of innovation? The two forces were either the market, as a collective group of customer requirements, or individual customers. In the first case a systematic analysis of the market led to the formulation of new requirements and design objectives. In the second case the development department of the textile loom producer reacted on requests related to specific customer orders, developed an appropriate solution, and later on tried to sell this solution to other companies. Again the dichotomy as I present it here is oversimplified and perhaps exaggerated. Market-driven customers do develop solutions for one particular customer as well, while some customer-driven textile loom producers would make attempts to combine several customer demands in a more general market trend.

If one maps the five different companies on a diagram which combines both dimension, one obtains Figure 1. Here I call the combination of these two dimensions the design philosophy of the company. Design philosophies, or the combination of product development philosophy and innovation focus, differs from one company to another.

The next question is obviously whether one can evaluate the different approaches to design philosophy. Interestingly enough there seemed to be no real correlation between success in the market place and design philosophy. The generation approach in product development has led in the past to major failures in the market place, and to serious delays in the introduction of new products. It would be easy to blame these failures on the fact that perhaps the basic assumption of knowledge about the design process was not correct. In fact one of the documented failures occurred in the company that had, according to my evaluation, the most impressive mastering of the design and production process. On the other hand some of the most successful companies adhered to the continuous adaptation approach. The two companies which adhered most closely to the continuous adaptation approach were considered to be the most entrepreneurial and flexible in responding to specific customer orders.

To what extent is the designing philosophy driven by production capabilities? Following the resource-based view of the firm (Cool and Dierickx, 1988; Prahalad and Hamel, 1990), one would expect these capabilities to influence strategy, and consequently the design philosophy. Each of the companies in the sample had invested in impressive machining capabilities. Each of them had a relatively simple final assembly line. The difference in the production capabilities concerned mostly the vertical integration with a foundry. Two of the companies had no foundry. Two of them had limited foundry capacity (below the needs of the own textile loom production), and one company had a foundry capacity of about three times its needs. This last company sold quite a few casts to third parties and tried to cover its fixed costs for the foundry with these orders. This production capability has a profound impact on the design choices. The frame can in theory be cast or can be made from steel profiles. This choice has serious consequences on the rest of the machine. This appeared to be a theoretical choice. The integration with a foundry determined indeed to a larger extent the design choice.

Interestingly enough, the degree of integration on the product level seemed to have less influence on the design of the machine than the degree of process integration. Three of the producers basically offer only looms. Two of the producers are more integrated and offer equally a number of other textile machines, such as preparatory machines or spinning machines. The fact that these companies can offer more integrated textile factories seemed to provide them with some advantage in the market, but did not seem to significantly influence the design of the loom. The only

impact seemed to be that the more integrated producers have somewhat more clearly developed visions about the computer-integrated textile factory. Everybody indeed moves to a more automated and integrated factory. But integration on the product level seemed to create a more complete vision of what the totally integrated textile factory (from a natural product such as cotton or wool to a fabric) could require.

3.2. Organisation of the development group

Each of the companies has a strongly developed functional development group. The development groups of each of the companies in the sample have a somewhat different portfolio of activities. All of them combine product modifications, new product developments and testing of the machine. But two of the companies also had the after-sales group in the development section. In one of the cases this has been the tradition since the sixties. In the second company this was the result of a recent restructuring. The choice to include the after-sales group in the development department was defended with the argument that service engineers and designers should have their desk next to each other. It was argued that this was the most effective way to provide good ideas to the designer. The company who applied this type of organisation since the fifties has actually made it a philosophy to send pairs of service engineers and designers to prospects, customers and major exhibitions. A service/design team is better able to evaluate the competitive offering, to level with a prospective customer, to get information of what has to be changed in a machine, and explain to prospective customers what is in the pipeline. In this case the close design/service relationship has contributed to the speed with which the development department is able to react to customer requests.

Though the development departments may have different task portfolios, it seems that the ratio of design personnel to number of machines sold is more or less constant (Table 1). Given that textile looms are often sold to customers with specific requests, it seems to be fairly normal that the number of design personnel is proportional to the number of machines sold. For the five cases in the sample, the number of design employees varied between 1 per 20 to 40 machines sold per year. The difference in efficiency may be explained by the type of markets to which the companies deliver, or the size of the company. It did not appear however that one of the companies was considerably more efficient in its development process.

In none of the companies did suppliers play a major role in the development process. Exception has to be made for all companies with respect to particular mechanical components for which some suppliers have a quasi monopoly. Secondly, it appeared that though electronic control systems are an important sub-assembly for the textile loom, with the exception of one company, none of the companies in the sample have developed an outstanding electronics design capacity. In nearly all cases the textile loom producers have developed close relationships with preferred electronics suppliers. Suppliers are involved in the later stages of the development process, during which prototype components have to be produced. In contrast to what one would hypothesize on the basis of other studies, there seemed to be no clear distinction between Japanese and European producers. Though one Japanese producer had a more strongly developed system to involve suppliers in the development of prototypes, the degree of this development was also strongly related to the degree of vertical integration of the producer. It happens that when it comes to design, one of the two least integrated producers is a Japanese company, the other one a European one. A difference existed however with respect to the number of suppliers. For the Japanese producers the number of suppliers varied from 130 to 500, and the number of major suppliers from 27 to 120. For the European producers the number of suppliers went up to 1750.

In all of the companies it appears that a job in development can be a lifetime one. In particular, in the three Japanese producers rotation to sales or production is very rare. Though they may start their professional life with a thorough training in production (in one case up to three years), most of the R&D engineers will spend the rest of their career in development. Within the technical or development department there will however be a lot of job rotation. Integration with other functions, and creating an awareness about design for manufacturability or responding to customer needs is often obtained through quality programmes, quality function development techniques or location of after-sales service within the development department.

3.3. Shortening development times

All five companies expressed the need to respond more rapidly to customer requests. Product life cycles in textile machinery may shorten, but more importantly, the ability to respond to a specific customer request was felt quite strongly. Product development times were not that different from one company to

another when it came to product modification. This is normal. In the end it is the customer's request that determines the due date for a quote, and delivery of the machine.

With respect to introduction of new generations, the development times were quite different (Table 2). The more the company adheres to the concept of a generation change, the longer the development cycle seemed to be.

Table 2: Development time for a generation change		
Company A	Product development philosophy	Development cycle time in years
A	New generation	6
B	New generation	3
C	Major product change	2
D	Sum of evolutionary changes forms a de facto new generation	1.5
E	Evolutionary	Continuous improvement

As we can see, each company was confronted with a different situation. It may thus emphasize in different ways the action programmes to reduce development time, the portfolio of potential action programmes was quite similar across the sample:

- a. A higher involvement of suppliers was considered a necessary condition: joint ventures or other formal ways of collaboration were considered by the smaller companies; a more active control over the supplier base was the objective for the large companies. The complaint about slow turnaround of mechanical parts developed by suppliers was common to four companies. This made these companies reluctant to involve suppliers more. Indeed, they feared that development times could lengthen by involving more suppliers for prototype development. Yet an increase in the involvement of suppliers in the development of prototype components was nevertheless mentioned by two of these companies.

- b. The availability of basic or seed technological competence in order to clear bottlenecks in development: during the development of a new machine, technical bottlenecks seem to appear. Independent development of off-the-shelf technologies was felt to provide a sort of library to fall back on, in case such a bottleneck appears. The companies which emphasize this approach happen to belong to the group which adheres to the generation approach.
- c. Quality methods such as QFD seem to work quite well for mechanical parts, but do not apply very well to development of software and electronic controls. Two companies were exploring ways to check development of what they called the 'intangible' elements of the machine, but more so how to check the processes that are used to develop these intangibles.
- d. Computer-based tools such as CAD, CAE, and simulation programmes, but in particular the integration of computer tools in design and manufacturing were emphasised by three companies.
- e. Three companies stressed the need to increase the speed with which the design specification of the machine will be defined and decided upon. One of the five companies had recently embarked on a major redesign programme, which had gone far beyond its original time schedule. Part of the blame for the delay was put on the inability of the company to quickly decide on the specifications in the planning stage.
- f. One company had developed a project management system which allowed it to determine which will be the bottlenecks in the development process. Their approach to speeding up the development was to allocate its 'best' designers (i.e. the ones with the highest design efficiency) to the development of not only the most advanced parts of the machine, but also to the bottlenecks in the development of the machine.
- g. Several companies were working on increasing the speed of turnaround of component testing. A wide range of tools were used:

simulation programmes to reduce the need for testing, testing under more difficult conditions in order to speed up the wear and tear on the component, or producing the components with temporary tools (as opposed to tools which could be used for production in case the component lived up to expectations).

- h. All companies seemed to have started programmes in order to improve design to cost attitudes and the speeding up of simulation and testing.

This set of action programmes is not that different to the ones which are reported for other industries (De Meyer and Van Hooland, 1990). Two observations have to be made. None of the companies was single-mindedly pursuing one action programme, but implemented a complex set of activities. Secondly, the companies adhering to the 'generation' approach applied relatively speaking more process-oriented action programmes, such as quality methods, development of off-the-shelf competence, etc. The companies adhering to the continuous approach invested more in design tools such as CAD, CAE, etc, and expected more from a higher involvement of suppliers. This last point is in agreement with their orientation towards components rather than to product integrity.

4. Discussion and Conclusion

With a limited set of companies, and a wide range of factors, it is impossible to derive a robust relationship between performance and action programmes. The challenge to do so would be even bigger since all companies have similar performances.

The most striking result of the study is that in a market which is highly global, and where there are only few competitors, we find two dimensions which enable us to define distinctive design philosophies. At one end of the spectrum, the know-how seems to reside in the machine and major changes are triggered by individual customer demands. Organisation and action programmes to shorten development cycle times seem to support that approach, and are often aimed at protecting the know-how embedded in the machine. At the other end of the spectrum, the know-how is still in the machine, but to a large extent also in the

development and production process and are mainly based on improvements and major market evolutions. For this latter group, it is easier to change the basic characteristics of the machine. Again, the organisation and action programmes deployed to shorten development cycle times are in line with the perception of where the competence of the company resides. This group is more product-oriented, emphasizes strongly organisational structures and a project approach to development. They consider it to be important to have a good database to rely on for both product modifications and production methods.

There seems to be some correlation between the two dimensions which form together what we have called the design philosophy. The more one takes the market as a focus of innovation, the more readily the company accepts a generation approach. The more an individual customer influences the innovation process, the more the textile loom manufacturer sticks to the original frame. Other correlations could be observed. I offer them here as two hypotheses. Since the sample is small, they may indeed be pure coincidences rather than correlations:

- a. Adherence to a continuous adaptation approach coincides with a stronger and more intensive interaction between the sales and development group. It is in the companies more oriented towards continuous adaptation that we observed that after sales service belonged to the development group.
- b. Adhering to the generation approach requires a closer, and more structurally organised collaboration between production, development and marketing groups.

The major conclusion is not that one or the other design philosophy is superior. No, several design philosophies with respect to what is a well defined machine and a very competitive market for an industrial product seem to work. This is in line with Clark and Fujimoto's observations about a consumer market such as the automobile market, where different design philosophies for mass market cars and high end specialty cars seem to be able to co-exist. That does not mean that anything goes. As in many other neo-contingency approaches, it means that design philosophy and the deployment of action programmes must be well aligned in order to guarantee success.

As a minor conclusion, I also would like to point out that performance differences and management methods do not coincide in this industry with geographical location. A comparison between Japanese and European producers does not prove to be fruitful in this industry.

NOTES

1. The communist and former communist countries have indeed large textile machinery companies. Some of these companies have introduced on the market looms which are based on other principles than the ones we have briefly indicated here. None of these prototypes have led to commercially successful products.

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88/08	Reinhard ANGELMAR and Susan SCHNEIDER	"Issues in the study of organizational cognition", February 1988.	88/20	Jean DERMINE, Damien NEVEN and J.F. THISSE	"Portfolio selection by mutual funds, an equilibrium model", March 1988.
88/09	Bernard SINCLAIR-DESGAGNÉ	"Price formation and product design through bidding", February 1988.	88/21	James TEBOUL	"De-industrialize service for quality", March 1988 (88/03 Revised).
88/10	Bernard SINCLAIR-DESGAGNÉ	"The robustness of some standard auction game forms", February 1988.	88/22	Lars-Hendrik RÖLLER	"Proper Quadratic Functions with an Application to AT&T", May 1987 (Revised March 1988).
88/11	Bernard SINCLAIR-DESGAGNÉ	"When stationary strategies are equilibrium bidding strategy: The single-crossing property", February 1988.			

88/23	Sjur Didrik FLAM and Georges ZACCOUR	"Equilibres de Nash-Cournot dans le marché européen du gaz: un cas où les solutions en boucle ouverte et en feedback coïncident", Mars 1988.	88/34	Mihkel M. TOMBAK	"Flexibility: an important dimension in manufacturing", June 1988.
88/24	B. Espen ECKBO and Herwig LANGOHR	"Information disclosure, means of payment, and takeover premia. Public and Private tender offers in France", July 1985, Sixth revision, April 1988.	88/35	Mihkel M. TOMBAK	"A strategic analysis of investment in flexible manufacturing systems", July 1988.
88/25	Everette S. GARDNER and Spyros MAKRIDAKIS	"The future of forecasting", April 1988.	88/36	Vikas TIBREWALA and Bruce BUCHANAN	"A Predictive Test of the NBD Model that Controls for Non-stationarity", June 1988.
88/26	Sjur Didrik FLAM and Georges ZACCOUR	"Semi-competitive Cournot equilibrium in multistage oligopolies", April 1988.	88/37	Murugappa KRISHNAN Lars-Hendrik RÖLLER	"Regulating Price-Liability Competition To Improve Welfare", July 1988.
88/27	Murugappa KRISHNAN Lars-Hendrik RÖLLER	"Entry game with resalable capacity", April 1988.	88/38	Manfred KETS DE VRIES	"The Motivating Role of Envy : A Forgotten Factor in Management", April 88.
88/28	Sumantra GHOSHAL and C. A. BARTLETT	"The multinational corporation as a network: perspectives from interorganizational theory", May 1988.	88/39	Manfred KETS DE VRIES	"The Leader as Mirror : Clinical Reflections", July 1988.
88/29	Naresh K. MALHOTRA, Christian PINSON and Arun K. JAIN	"Consumer cognitive complexity and the dimensionality of multidimensional scaling configurations", May 1988.	88/40	Josef LAKONISHOK and Theo VERMAELEN	"Anomalous price behavior around repurchase tender offers", August 1988.
88/30	Catherine C. ECKEL and Theo VERMAELEN	"The financial fallout from Chernobyl: risk perceptions and regulatory response", May 1988.	88/41	Charles WYPLOSZ	"Assymetry in the EMS: intentional or systemic?", August 1988.
88/31	Sumantra GHOSHAL and Christopher BARTLETT	"Creation, adoption, and diffusion of innovations by subsidiaries of multinational corporations", June 1988.	88/42	Paul EVANS	"Organizational development in the transnational enterprise", June 1988.
88/32	Kasra FERDOWS and David SACKRIDER	"International manufacturing: positioning plants for success", June 1988.	88/43	B. SINCLAIR-DESGAGNÉ	"Group decision support systems implement Bayesian rationality", September 1988.
88/33	Mihkel M. TOMBAK	"The importance of flexibility in manufacturing", June 1988.	88/44	Essam MAHMOUD and Spyros MAKRIDAKIS	"The state of the art and future directions in combining forecasts", September 1988.
			88/45	Robert KORAJCZYK and Claude VIALLET	"An empirical investigation of international asset pricing", November 1986, revised August 1988.
			88/46	Yves DOZ and Amy SHUEN	"From intent to outcome: a process framework for partnerships", August 1988.
			88/47	Alain BULTEZ, Els GIJSBRECHTS.	"Asymmetric cannibalism between substitute items listed by retailers", September 1988.

	Philippe NAERT and Piet VANDEN ABEELE		88/59	Martin KILDUFF	"The interpersonal structure of decision making: a social comparison approach to organizational choice", November 1988.
88/48	Michael BURDA	"Reflections on 'Wait unemployment' in Europe, II", April 1988 revised September 1988.	88/60	Michael BURDA	"Is mismatch really the problem? Some estimates of the Chelwood Gate II model with US data", September 1988.
88/49	Nathalie DIERKENS	"Information asymmetry and equity issues", September 1988.	88/61	Lars-Hendrik RÖLLER	"Modelling cost structure: the Bell System revisited", November 1988.
88/50	Rob WEITZ and Arnoud DE MEYER	"Managing expert systems: from inception through updating", October 1987.	88/62	Cynthia VAN HULLE, Theo VERMAELEN and Paul DE WOUTERS	"Regulation, taxes and the market for corporate control in Belgium", September 1988.
88/51	Rob WEITZ	"Technology, work, and the organization: the impact of expert systems", July 1988.	88/63	Fernando NASCIMENTO and Wilfried R. VANHONACKER	"Strategic pricing of differentiated consumer durables in a dynamic duopoly: a numerical analysis", October 1988.
88/52	Susan SCHNEIDER and Reinhard ANGELMAR	"Cognition and organizational analysis: who's minding the store?", September 1988.	88/64	Kasra FERDOWS	"Charting strategic roles for international factories", December 1988.
88/53	Manfred KETS DE VRIES	"Whatever happened to the philosopher-king: the leader's addiction to power, September 1988.	88/65	Arnoud DE MEYER and Kasra FERDOWS	"Quality up, technology down", October 1988
88/54	Lars-Hendrik RÖLLER and Mihkel M. TOMBAK	"Strategic choice of flexible production technologies and welfare implications", October 1988	88/66	Nathalie DIERKENS	"A discussion of exact measures of information asymmetry: the example of Myers and Majluf model or the importance of the asset structure of the firm", December 1988.
88/55	Peter BOSSAERTS and Pierre HILLION	"Method of moments tests of contingent claims asset pricing models", October 1988.	88/67	Paul S. ADLER and Kasra FERDOWS	"The chief technology officer", December 1988.
88/56	Pierre HILLION	"Size-sorted portfolios and the violation of the random walk hypothesis: Additional empirical evidence and implication for tests of asset pricing models", June 1988.			
			<u>1989</u>		
88/57	Wilfried VANHONACKER and Lydia PRICE	"Data transferability: estimating the response effect of future events based on historical analogy", October 1988.	89/01	Joyce K. BYRER and Tawfik JELASSI	"The impact of language theories on DSS dialog", January 1989.
88/58	B. SINCLAIR-DESGAGNÉ and Mihkel M. TOMBAK	"Assessing economic inequality", November 1988.	89/02	Louis A. LE BLANC and Tawfik JELASSI	"DSS software selection: a multiple criteria decision methodology", January 1989.

89/03	Beth H. JONES and Tawfik JELASSI	"Negotiation support: the effects of computer intervention and conflict level on bargaining outcome", January 1989.	89/13	Manfred KETS DE VRIES	"The impostor syndrome: a disquieting phenomenon in organizational life", February 1989.
89/04	Kasra FERDOWS and Arnoud DE MEYER	"Lasting improvement in manufacturing performance: In search of a new theory", January 1989.	89/14	Reinhard ANGELMAR	"Product innovation: a tool for competitive advantage", March 1989.
89/05	Martin KILDUFF and Reinhard ANGELMAR	"Shared history or shared culture? The effects of time, culture, and performance on institutionalization in simulated organizations", January 1989.	89/15	Reinhard ANGELMAR	"Evaluating a firm's product innovation performance", March 1989.
89/06	Mihkel M. TOMBAK and B. SINCLAIR-DESGAGNÉ	"Coordinating manufacturing and business strategies: I", February 1989.	89/16	Wilfried VANHONACKER, Donald LEHMANN and Fareena SULTAN	"Combining related and sparse data in linear regression models", February 1989.
89/07	Damien J. NEVEN	"Structural adjustment in European retail banking. Some view from industrial organisation", January 1989.	89/17	Gilles AMADO, Claude FAUCHEUX and André LAURENT	"Changement organisationnel et réalités culturelles; contrastes franco-américains", March 1989.
89/08	Arnoud DE MEYER and Hellmut SCHÜTTE	"Trends in the development of technology and their effects on the production structure in the European Community", January 1989.	89/18	Srinivasan BALAK- RISHNAN and Mitchell KOZA	"Information asymmetry, market failure and joint-ventures: theory and evidence", March 1989.
89/09	Damien NEVEN, Carmen MATUTES and Marcel CORSTJENS	"Brand proliferation and entry deterrence", February 1989.	89/19	Wilfried VANHONACKER, Donald LEHMANN and Fareena SULTAN	"Combining related and sparse data in linear regression models", Revised March 1989.
89/10	Nathalie DIERKENS, Bruno GERARD and Pierre HILLION	"A market based approach to the valuation of the assets in place and the growth opportunities of the firm", December 1988.	89/20	Wilfried VANHONACKER and Russell WINER	"A rational random behavior model of choice", Revised March 1989.
89/11	Manfred KETS DE VRIES and Alain NOEL	"Understanding the leader-strategy interface: application of the strategic relationship interview method", February 1989.	89/21	Arnoud de MEYER and Kasra FERDOWS	"Influence of manufacturing improvement programmes on performance", April 1989.
89/12	Wilfried VANHONACKER	"Estimating dynamic response models when the data are subject to different temporal aggregation", January 1989.	89/22	Manfred KETS DE VRIES and Sydney PERZOW	"What is the role of character in psychoanalysis?" April 1989.
			89/23	Robert KORAJCZYK and Claude VIALLET	"Equity risk premia and the pricing of foreign exchange risk" April 1989.
			89/24	Martin KILDUFF and Mitchel ABOLAFIA	"The social destruction of reality: Organisational conflict as social drama" zApril 1989.

89/25	Roger BETANCOURT and David GAUTSCHI	"Two essential characteristics of retail markets and their economic consequences" March 1989.	89/36	Martin KILDUFF	"A dispositional approach to social networks: the case of organizational choice", May 1989.
89/26	Charles BEAN, Edmond MALINVAUD, Peter BERNHOLZ, Francesco GIAVAZZI and Charles WYPLOSZ	"Macroeconomic policies for 1992: the transition and after", April 1989.	89/37	Manfred KETS DE VRIES	"The organisational fool: balancing a leader's hubris", May 1989.
89/27	David KRACKHARDT and Martin KILDUFF	"Friendship patterns and cultural attributions: the control of organizational diversity", April 1989.	89/38	Manfred KETS DE VRIES	"The CEO blues", June 1989.
89/28	Martin KILDUFF	"The interpersonal structure of decision making: a social comparison approach to organizational choice", Revised April 1989.	89/39	Robert KORAJCZYK and Claude VIALLET	"An empirical investigation of international asset pricing", (Revised June 1989).
89/29	Robert GOGEL and Jean-Claude LARRECHE	"The battlefield for 1992: product strength and geographic coverage", May 1989.	89/40	Balaji CHAKRAVARTHY	"Management systems for innovation and productivity", June 1989.
89/30	Lars-Hendrik ROLLER and Mihkel M. TOMBAK	"Competition and Investment in Flexible Technologies", May 1989.	89/41	B. SINCLAIR-DESGAGNE and Nathalie DIERKENS	"The strategic supply of precisions", June 1989.
89/31	Michael C. BURDA and Stefan GERLACH	"Intertemporal prices and the US trade balance in durable goods", July 1989.	89/42	Robert ANSON and Tawfik JELASSI	"A development framework for computer-supported conflict resolution", July 1989.
89/32	Peter HAUG and Tawfik JELASSI	"Application and evaluation of a multi-criteria decision support system for the dynamic selection of U.S. manufacturing locations", May 1989.	89/43	Michael BURDA	"A note on firing costs and severance benefits in equilibrium unemployment", June 1989.
89/33	Bernard SINCLAIR-DESGAGNÉ	"Design flexibility in monopsonistic industries", May 1989.	89/44	Balaji CHAKRAVARTHY and Peter LORANGE	"Strategic adaptation in multi-business firms", June 1989.
89/34	Sumantra GHOSHAL and Nitin NOHRIA	"Requisite variety versus shared values: managing corporate-division relationships in the M-Form organisation", May 1989.	89/45	Rob WEITZ and Arnoud DE MEYER	"Managing expert systems: a framework and case study", June 1989.
89/35	Jean DERMINE and Pierre HILLION	"Deposit rate ceilings and the market value of banks: The case of France 1971-1981", May 1989.	89/46	Marcel CORSTJENS, Carmen MATUTES and Damien NEVEN	"Entry Encouragement", July 1989.
			89/47	Manfred KETS DE VRIES and Christine MEAD	"The global dimension in leadership and organization: issues and controversies", April 1989.
			89/48	Damien NEVEN and Lars-Hendrik RÖLLER	"European integration and trade flows", August 1989.

89/49	Jean DERMINE	"Home country control and mutual recognition", July 1989.	89/62 (TM)	Arnoud DE MEYER	"Technology strategy and international R&D operations", October 1989.
89/50	Jean DERMINE	"The specialization of financial institutions, the EEC model", August 1989.	89/63 (TM)	Enver YUCESAN and Lee SCHRUBEN	"Equivalence of simulations: A graph approach", November 1989.
89/51	Spyros MAKRIDAKIS	"Sliding simulation: a new approach to time series forecasting", July 1989.	89/64 (TM)	Enver YUCESAN and Lee SCHRUBEN	"Complexity of simulation models: A graph theoretic approach", November 1989.
89/52	Arnoud DE MEYER	"Shortening development cycle times: a manufacturer's perspective", August 1989.	89/65 (TM, AC, FIN)	Soumitra DUTTA and Piero BONISSONE	"MARS: A mergers and acquisitions reasoning system", November 1989.
89/53	Spyros MAKRIDAKIS	"Why combining works?", July 1989.	89/66 (TM,EP)	B. SINCLAIR-DESGAGNÉ	"On the regulation of procurement bids", November 1989.
89/54	S. BALAKRISHNAN and Mitchell KOZA	"Organisation costs and a theory of joint ventures", September 1989.	89/67 (FIN)	Peter BOSSAERTS and Pierre HILLION	"Market microstructure effects of government intervention in the foreign exchange market", December 1989.
89/55	H. SCHUTTE	"Euro-Japanese cooperation in information technology", September 1989.			
89/56	Wilfried VANHONACKER and Lydia PRICE	"On the practical usefulness of meta-analysis results", September 1989.			
			<u>1990</u>		
89/57	Tackwon KIM, Lars-Hendrik RÖLLER and Mihkel TOMBAK	"Market growth and the diffusion of multiproduct technologies", September 1989.	90/01 TM/EP/AC	B. SINCLAIR-DESGAGNÉ	"Unavoidable Mechanisms", January 1990.
89/58 (EP,TM)	Lars-Hendrik RÖLLER and Mihkel TOMBAK	"Strategic aspects of flexible production technologies", October 1989.	90/02 EP	Michael BURDA	"Monopolistic Competition, Costs of Adjustment, and the Behaviour of European Manufacturing Employment", January 1990.
89/59 (OB)	Manfred KETS DE VRIES, Daphna ZEVADI, Alain NOEL and Mihkel TOMBAK	"Locus of control and entrepreneurship: a three-country comparative study", October 1989.	90/03 TM	Arnoud DE MEYER	"Management of Communication in International Research and Development", January 1990.
89/60 (TM)	Enver YUCESAN and Lee SCHRUBEN	"Simulation graphs for design and analysis of discrete event simulation models", October 1989.	90/04 FIN/EP	Gabriel HAWAWINI and Eric RAJENDRA	"The Transformation of the European Financial Services Industry: From Fragmentation to Integration", January 1990.
89/61 (All)	Susan SCHNEIDER and Arnoud DE MEYER	"Interpreting and responding to strategic issues: The impact of national culture", October 1989.	90/05 FIN/EP	Gabriel HAWAWINI and Bertrand JACQUILLAT	"European Equity Markets: Toward 1992 and Beyond", January 1990.

90/06 FIN/EP	Gabriel HAWAWINI and Eric RAJENDRA	"Integration of European Equity Markets: Implications of Structural Change for Key Market Participants to and Beyond 1992", January 1990.	90/17 FIN	Nathalie DIERKENS	"Information Asymmetry and Equity Issues", Revised January 1990.
90/07 FIN/EP	Gabriel HAWAWINI	"Stock Market Anomalies and the Pricing of Equity on the Tokyo Stock Exchange", January 1990.	90/18 MKT	Wilfried VANHONACKER	"Managerial Decision Rules and the Estimation of Dynamic Sales Response Models", Revised January 1990.
90/08 TM/EP	Tawfik JELASSI and B. SINCLAIR-DESGAGNÉ	"Modelling with MCDSS: What about Ethics?", January 1990.	90/19 TM	Beth JONES and Tawfik JELASSI	"The Effect of Computer Intervention and Task Structure on Bargaining Outcome", February 1990.
90/09 EP/FIN	Alberto GIOVANNINI and Jae WON PARK	"Capital Controls and International Trade Finance", January 1990.	90/20 TM	Tawfik JELASSI, Gregory KERSTEN and Stanley ZIONTS	"An Introduction to Group Decision and Negotiation Support", February 1990.
90/10 TM	Joyce BRYER and Tawfik JELASSI	"The Impact of Language Theories on DSS Dialog", January 1990.	90/21 FIN	Roy SMITH and Ingo WALTER	"Reconfiguration of the Global Securities Industry in the 1990's", February 1990.
90/11 TM	Enver YUCESAN	"An Overview of Frequency Domain Methodology for Simulation Sensitivity Analysis", January 1990.	90/22 FIN	Ingo WALTER	"European Financial Integration and Its Implications for the United States", February 1990.
90/12 EP	Michael BURDA	"Structural Change, Unemployment Benefits and High Unemployment: A U.S.-European Comparison", January 1990.	90/23 EP/SM	Damien NEVEN	"EEC Integration towards 1992: Some Distributional Aspects", Revised December 1989
90/13 TM	Soumitra DUTTA and Shashi SHEKHAR	"Approximate Reasoning about Temporal Constraints in Real Time Planning and Search", January 1990.	90/24 FIN/EP	Lars Tyge NIELSEN	"Positive Prices in CAPM", January 1990.
90/14 TM	Albert ANGEHRN and Hans-Jakob LÜTHI	"Visual Interactive Modelling and Intelligent DSS: Putting Theory Into Practice", January 1990.	90/25 FIN/EP	Lars Tyge NIELSEN	"Existence of Equilibrium in CAPM", January 1990.
90/15 TM	Arnoud DE MEYER, Dirk DESCHOOLMEESTER, Rudy MOENAERT and Jan BARBE	"The Internal Technological Renewal of a Business Unit with a Mature Technology", January 1990.	90/26 OB/BI	Charles KADUSHIN and Michael BRIMM	"Why networking Fails: Double Binds and the Limitations of Shadow Networks", February 1990.
90/16 FIN	Richard LEVICH and Ingo WALTER	"Tax-Driven Regulatory Drag: European Financial Centers in the 1990's", January 1990.	90/27 TM	Abbas FOROUGHI and Tawfik JELASSI	"NSS Solutions to Major Negotiation Stumbling Blocks", February 1990.
			90/28 TM	Arnoud DE MEYER	"The Manufacturing Contribution to Innovation", February 1990.

90/29 FIN/AC	Nathalie DIERKENS	"A Discussion of Correct Measures of Information Asymmetry", January 1990.	90/40 OB	Manfred KETS DE VRIES	"Leaders on the Couch: The case of Roberto Calvi", April 1990.
90/30 FIN/EP	Lars Tyge NIELSEN	"The Expected Utility of Portfolios of Assets", March 1990.	90/41 FIN/EP	Gabriel HAWAWINI, Itzhak SWARY and Ik HWAN JANG	"Capital Market Reaction to the Announcement of Interstate Banking Legislation", March 1990.
90/31 MKT/EP	David GAUTSCHI and Roger BETANCOURT	"What Determines U.S. Retail Margins?", February 1990.	90/42 MKT	Joel STECKEL and Wilfried VANHONACKER	"Cross-Validating Regression Models in Marketing Research", (Revised April 1990).
90/32 SM	Srinivasan BALAK- RISHNAN and Mitchell KOZA	"Information Asymmetry, Adverse Selection and Joint-Ventures: Theory and Evidence", Revised, January 1990.	90/43 FIN	Robert KORAJCZYK and Claude VIALLET	"Equity Risk Premia and the Pricing of Foreign Exchange Risk", May 1990.
90/33 OB	Caren SIEHL, David BOWEN and Christine PEARSON	"The Role of Rites of Integration in Service Delivery", March 1990.	90/44 OB	Gilles AMADO, Claude FAUCHEUX and André LAURENT	"Organisational Change and Cultural Realities: Franco-American Contrasts", April 1990.
90/34 FIN/EP	Jean DERMINE	"The Gains from European Banking Integration, a Call for a Pro-Active Competition Policy", April 1990.	90/45 TM	Soumitra DUTTA and Piero BONISSONE	"Integrating Case Based and Rule Based Reasoning: The Possibilistic Connection", May 1990.
90/35 EP	Jae Won PARK	"Changing Uncertainty and the Time-Varying Risk Premia in the Term Structure of Nominal Interest Rates", December 1988, Revised March 1990.	90/46 TM	Spyros MAKRIDAKIS and Michèle HIBON	"Exponential Smoothing: The Effect of Initial Values and Loss Functions on Post-Sample Forecasting Accuracy".
90/36 TM	Arnoud DE MEYER	"An Empirical Investigation of Manufacturing Strategies in European Industry", April 1990.	90/47 MKT	Lydia PRICE and Wilfried VANHONACKER	"Improper Sampling in Natural Experiments: Limitations on the Use of Meta-Analysis Results in Bayesian Updating", Revised May 1990.
90/37 TM/OB/SM	William CATS-BARIL	"Executive Information Systems: Developing an Approach to Open the Possibles", April 1990.	90/48 EP	Jae WON PARK	"The Information in the Term Structure of Interest Rates: Out-of-Sample Forecasting Performance", June 1990.
90/38 MKT	Wilfried VANHONACKER	"Managerial Decision Behaviour and the Estimation of Dynamic Sales Response Models", (Revised February 1990).	90/49 TM	Soumitra DUTTA	"Approximate Reasoning by Analogy to Answer Null Queries", June 1990.
90/39 TM	Louis LE BLANC and Tawfik JELASSI	"An Evaluation and Selection Methodology for Expert System Shells", May 1990.	90/50 EP	Daniel COHEN and Charles WYPLOSZ	"Price and Trade Effects of Exchange Rates Fluctuations and the Design of Policy Coordination", April 1990.

90/51 EP	Michael BURDA and Charles WYPLOSZ	"Gross Labour Market Flows in Europe: Some Stylized Facts", June 1990.	90/63 SM	Sumantra GHOSHAL and Eleanor WESTNEY	"Organising Competitor Analysis Systems", August 1990
90/52 FIN	Lars Tye NIELSEN	"The Utility of Infinite Menus", June 1990.	90/64 SM	Sumantra GHOSHAL	"Internal Differentiation and Corporate Performance: Case of the Multinational Corporation", August 1990
90/53 EP	Michael Burda	"The Consequences of German Economic and Monetary Union", June 1990.	90/65 EP	Charles WYPLOSZ	"A Note on the Real Exchange Rate Effect of German Unification", August 1990
90/54 EP	Damien NEVEN and Colin MEYER	"European Financial Regulation: A Framework for Policy Analysis", (Revised May 1990).	90/66 TM/SE/FIN	Soumitra DUTTA and Piero BONISSONE	"Computer Support for Strategic and Tactical Planning in Mergers and Acquisitions", September 1990
90/55 EP	Michael BURDA and Stefan GERLACH	"Intertemporal Prices and the US Trade Balance", (Revised July 1990).	90/67 TM/SE/FIN	Soumitra DUTTA and Piero BONISSONE	"Integrating Prior Cases and Expert Knowledge In a Mergers and Acquisitions Reasoning System", September 1990
90/56 EP	Damien NEVEN and Lars-Hendrik RÖLLER	"The Structure and Determinants of East-West Trade: A Preliminary Analysis of the Manufacturing Sector", July 1990	90/68 TM/SE	Soumitra DUTTA	"A Framework and Methodology for Enhancing the Business Impact of Artificial Intelligence Applications", September 1990
90/57 FIN/EP/ TM	Lars Tye NIELSEN	Common Knowledge of a Multivariate Aggregate Statistic", July 1990	90/69 TM	Soumitra DUTTA	"A Model for Temporal Reasoning in Medical Expert Systems", September 1990
90/58 FIN/EP/TM	Lars Tye NIELSEN	"Common Knowledge of Price and Expected Cost in an Oligopolistic Market", August 1990	90/70 TM	Albert ANGEHRN	"Triple C': A Visual Interactive MCDSS", September 1990
90/59 FIN	Jean DERMINE and Lars-Hendrik RÖLLER	"Economies of Scale and Scope in the French Mutual Funds (SICAV) Industry", August 1990	90/71 MKT	Philip PARKER and Hubert GATIGNON	"Competitive Effects in Diffusion Models: An Empirical Analysis", September 1990
90/60 TM	Peri IZ and Tawfik JELASSI	"An Interactive Group Decision Aid for Multiobjective Problems: An Empirical Assessment", September 1990	90/72 TM	Enver YÜCESAN	"Analysis of Markov Chains Using Simulation Graph Models", October 1990
90/61 TM	Pankaj CHANDRA and Mihkel TOMBAK	"Models for the Evaluation of Manufacturing Flexibility", August 1990	90/73 TM	Arnoud DE MEYER and Kasra FERDOWS	"Removing the Barriers in Manufacturing", October 1990
90/62 EP	Damien NEVEN and Menno VAN DIJK	"Public Policy Towards TV Broadcasting in the Netherlands", August 1990	90/74 SM	Sumantra GHOSHAL and Nitin NOHRIA	"Requisite Complexity: Organising Headquarters- Subsidiary Relations in MNCs", October 1990

90/75 MKT	Roger BETANCOURT and David GAUTSCHI	"The Outputs of Retail Activities: Concepts, Measurement and Evidence", October 1990	90/87 FIN/EP	Lars Tyge NIELSEN	"Existence of Equilibrium in CAPM: Further Results", December 1990
90/76 MKT	Wilfried VANHONACKER	"Managerial Decision Behaviour and the Estimation of Dynamic Sales Response Models", Revised October 1990	90/88 OB/MKT	Susan C. SCHNEIDER and Reinhard ANGELMAR	"Cognition in Organisational Analysis: Who's Minding the Store?" Revised, December 1990
90/77 MKT	Wilfried VANHONACKER	"Testing the Koyck Scheme of Sales Response to Advertising: An Aggregation-Independent Autocorrelation Test", October 1990	90/89 OB	Manfred F.R. KETS DE VRIES	"The CEO Who Couldn't Talk Straight and Other Tales from the Board Room," December 1990
90/78 EP	Michael BURDA and Stefan GERLACH	"Exchange Rate Dynamics and Currency Unification: The Ostmark - DM Rate", October 1990	90/90 MKT	Philip PARKER	"Price Elasticity Dynamics over the Adoption Lifecycle: An Empirical Study," December 1990
90/79 TM	Anil GABA	"Inferences with an Unknown Noise Level in a Bernoulli Process", October 1990			
90/80 TM	Anil GABA and Robert WINKLER	"Using Survey Data in Inferences about Purchase Behaviour", October 1990	1991		
90/81 TM	Tawfik JELASSI	"Du Présent au Futur: Bilan et Orientations des Systèmes Interactifs d'Aide à la Décision," October 1990	91/01 TM/SM	Luk VAN WASSENHOVE, Leonard FORTUIN and Paul VAN BEEK	"Operational Research Can Do More for Managers Than They Think!," January 1991
90/82 EP	Charles WYPLOSZ	"Monetary Union and Fiscal Policy Discipline," November 1990	91/02 TM/SM	Luk VAN WASSENHOVE, Leonard FORTUIN and Paul VAN BEEK	"Operational Research and Environment," January 1991
90/83 FIN/TM	Nathalie DIERKENS and Bernard SINCLAIR-DESGAGNE	"Information Asymmetry and Corporate Communication: Results of a Pilot Study", November 1990	91/03 FIN	Pekka HIETALA and Timo LÖYTTYNIEMI	"An Implicit Dividend Increase in Rights Issues: Theory and Evidence," January 1991
90/84 MKT	Philip M. PARKER	"The Effect of Advertising on Price and Quality: The Optometric Industry Revisited," December 1990	91/04 FIN	Lars Tyge NIELSEN	"Two-Fund Separation, Factor Structure and Robustness," January 1991
90/85 MKT	Avijit GHOSH and Vikas TIBREWALA	"Optimal Timing and Location in Competitive Markets," November 1990	91/05 OB	Susan SCHNEIDER	"Managing Boundaries in Organisations," January 1991
90/86 EP/TM	Olivier CADOT and Bernard SINCLAIR-DESGAGNE	"Prudence and Success in Politics," November 1990	91/06 OB	Manfred KETS DE VRIES, Danny MILLER and Alain NOEL	"Understanding the Leader-Strategy Interface: Application of the Strategic Relationship Interview Method," January 1990 (89/11, revised April 1990)

91/07 EP	Olivier CADOT	"Leading to Insolvent Countries: A Paradoxical Story," January 1991	91/19 MKT	Vikas TIBREWALA and Bruce BUCHANAN	"An Aggregate Test of Purchase Regularity", March 1991
91/08 EP	Charles WYPLOSZ	"Post-Reform East and West: Capital Accumulation and the Labour Mobility Constraint," January 1991	91/20 MKT	Darius SABAVALA and Vikas TIBREWALA	"Monitoring Short-Run Changes in Purchasing Behaviour", March 1991
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