

**"EUROPEAN MANUFACTURERS:  
THE DANGERS OF COMPLACENCY"**

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## A B S T R A C T

### EUROPEAN MANUFACTURERS: THE DANGERS OF COMPLACENCY

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Recent trends in the activities of a sample of European manufacturers are analysed in this paper. The data have been collected through annual surveys in the last five years, and in particular, the results of the 1987 survey (222 responses received in the first trimester of 1987) have been analysed in more depth.

The priorities set for the development of various types of capabilities in manufacturing (related to quality, delivery, flexibility, cost, etc.), and the specific programmes under implementation for improvement of manufacturing performance which are receiving highest attention are described. Through correlation analyses, statistically significant associations between specific improvement programmes and profitability and growth are also established.

The picture that emerges is one which shows the typical large European manufacturer (as judged from this sample) showing more confidence than in previous years. This manufacturer, after being shaken up by a recurring profitability crisis and the discovery of low-price high-quality competitive products in the early 1980's, believes that he has restructured his manufacturing and is closing the gap in quality. However, there is a danger of becoming complacent at the expense of not preparing for the next competitive battle driven by manufacturing flexibility.

## EUROPEAN MANUFACTURERS: THE DANGERS OF COMPLACENCY

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Management of manufacturing has received considerable attention in recent years. Most of the attention, however, has focused on the Japanese and American practices; the European manufacturing practices have been, relatively, understudied. Given the share of (western) Europe in world economy, this is an oversight. Europe has had a long history as a manufacturing power and still is a major competitor in the global manufacturing trade.

While manufacturing practices in a few European countries--notably Germany, United Kingdom, and Sweden--have been studied in more depth, there are very few research efforts which focus on Europe as a whole. We started a major research project five years ago to learn about the management of manufacturing in a sample of large companies spread in 14 European countries. The sample has varied between 150 and 220 manufacturers from year to year. With five years of observations (1983-87), it is now possible to discern and monitor trends. Basing our analysis on these data, our purpose in this article is to assess the manufacturing practices of the large European companies, and to suggest the implications of these practices for competitive capabilities.

### THE DATA

The data for this research has been collected through annual surveys. Since 1983, we have sent a questionnaire to about 1000 large manufacturers in 14 European countries; the response rate has varied between 15 and 28 percent. The purpose of these on-going surveys--which we call "European Manufacturing Surveys"--is to build a data base on manufacturing management practices in Europe. Similar surveys have also been administered by our research collaborators in North America and Japan<sup>1</sup>. Therefore, not only can the European results be directly compared with those in North America and Japan, but together, these projects provide a rich data base for both scholars and executives worldwide to explore a variety of research questions.

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1. The American Manufacturing Futures Surveys are carried out by a research team at Boston University, where Professor J.G. Miller started the Manufacturing Futures project in 1982. The Japanese Manufacturing Futures Surveys are carried out by a research team at Waseda University under the direction of Professor Jinichiro Nakane. Both the Japanese and the European Surveys started in 1983.

Our focus in this paper is on Europe, and more specifically on the most recent developments in manufacturing management there. The relevant data, therefore, are those collected in our 1987 Survey.

### **The Sample**

The questionnaires were mailed at end of 1986 to about eight hundred senior manufacturing managers in large manufacturing companies in fourteen European countries. The list was compiled from various directories in these countries. Two hundred and twenty-two valid responses were received during the first trimester of 1987 (28% response rate). Table 1 shows the distribution of the sample per country; Table 2 shows their distribution according to their primary products.

Although the sample is not representative for the European industry, it is not biased either towards a particular industry or country. Furthermore, there are no significant differences in the mix of industries represented by respondents from various countries.

The questionnaire contained over 300 questions about the company and/or one of its business units. The questions asked for data on the structure and environment of manufacturing in the business unit and the current managerial practices and plans in this function. For the latter, most of the questions asked the respondents to indicate on a seven-point Likert scale the degree of emphasis or importance of specific action plans, improvement programmes, performance objectives, competitive priorities, managerial concerns, and the like.

### **Respondents Profile**

The respondents were mostly senior managers in manufacturing. The typical (median<sup>2</sup>) respondent was from a business unit with sales of 127 million ECU's (or \$ 136 million at exchange rate on 1/1/87), belonging to a company with sales of 727 million ECU's. The business unit's profit was 5 % of sales last year, and its sales (in physical units) had grown by 7 %. It spent 3 % of its sales on research and development. The market share for its primary product was estimated to be larger than that of its main competitor. Its investments in new plants and equipment during the last fiscal year was 5 million ECU's, and about 400 direct and 200 indirect workers were employed in its manufacturing.

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2. We have used the median answers to describe the characteristics of the "typical" respondent.

**TABLE 1 : Distribution of responses by country**

		%
Austria	4	2
Belgium	22	10
Denmark	28	13
United Kingdom	39	18
Finland	8	4
France	26	12
Federal Republic of Germany	41	19
Holland	14	6
Ireland	5	2
Italy	13	6
Norway	1	1
Spain	7	3
Switzerland	7	3
Sweden	7	3
<b>TOTAL</b>	<b>222</b>	<b>100</b>

**TABLE 2 : Distribution of the responses by customer/market focus**

		%
Consumer durables	44	20
Consumer non-durables	47	21
Industrial capital goods	58	26
Raw or semi-finished materials	21	10
Components for finished goods	29	13
Industrial supplies/consumables	12	5
Others	11	5
<b>TOTAL</b>	<b>222</b>	<b>100</b>

On the average (not to be confused with the median), the manufacturing costs as a percentage of sales of the business unit was 57 %, although it varied considerably among the respondents. The components of the manufacturing costs are shown in Table 3.

**Table 3 : Cost Structure of Average Respondent**

a) Material		53%
b) Direct Labour		17%
c) Energy		5%
d) Manufacturing Overhead		25%
of which:		
Indirect salaries, wages, fringes	48	
Depreciation & facilities expense	23	
Corporate allocations	14	
Other	13	
	100%	100%

Aside from the statistics, examination of the total list gives a clear impression that the responding companies were in fact generally large manufacturers and important players in their respective markets. Many of the famous international companies with large manufacturing operations in Europe could be found in the sample.

With the characteristics of the sample thus defined, we now turn to the analysis of the 1987 results. First, we describe the foci of activities of the total sample; second, we examine the relationship between some of these activities and the profitability and growth of the business unit.

#### **FOCI OF ACTIVITIES OF EUROPEAN MANUFACTURERS**

How are the manufacturers in our sample coping with and preparing for future competition? Most of the questionnaire was aimed at finding an answer to this question. The starting point was to examine the importance of various competitive priorities which had a direct influence on manufacturing capabilities.

## Competitive Manufacturing Capabilities

The respondents were asked to indicate the relative importance of nine specific capabilities for competing in the next five years (i.e., through 1992). Table 4 shows the ranking of the responses.

**Table 4: Relative Importance of Competitive Capabilities**  
Five-year Horizon as of 1987

Rank	Capability
1.	Offer consistent reliable quality (Conformance)
2.	Make dependable delivery promises (Delivery)
2.	Provide high performance products (Performance)
4.	Provide fast delivery (Speed)
5.	Change production plans quickly (Plan)
5.	Introduce new products/design changes quickly (Design)
5.	Offer low prices (Cost)
8.	Offer a broad product line (Breadth)
8.	Make rapid volume change (Volume)

### Notes:

- a) Similar ranks reflect lack of significant difference on the basis of a Wilcoxon matched pairs signed rank test at 5 % level. Number 1 indicates highest importance.
- b) The words in parentheses are used to indicate these capabilities in graphs and tables that follow.

The ranking of these capabilities has been remarkably stable in the last five years. In 1987 we added two new items to this list (Plan and Breadth) and dropped one (Providing after-sales service). Therefore, the results are not directly comparable. Nevertheless, as Table 5 shows, Conformance to quality standards has been consistently on the top of the list, followed by Delivery, Performance, and Speed; flexibility related capabilities--Design, Volume--have generally been on the bottom of the list, with Cost in the middle.

**Table 5: Relative Importance of Competitive Capabilities**  
Ranks in 1983-86

CAPABILITY	1986	1985	1984	1983
Consistent quality (Conformance)	2	1	1	1
High performance (Performance)	2	2	2	1
On-time delivery (Delivery)	3	3	3	3
Low price (Cost)	4	4	4	4
Fast deliveries (Speed)	5	5	5	6
Rapid design changes (Design)	6	5	5	5
After-sale service (Service)	7	7	7	7
Rapid volume changes (Volume)	8	8	8	8

Moreover, there is a remarkable similarity between the rankings of the competitive capabilities between the Europeans and Americans during these five years, but not with the Japanese. The Japanese consistently put Price on the top of the list followed by Design [1], [2]. One explanation offered for this has been that the Japanese have been aiming at beyond the capability to produce to high quality standards (Conformance) and have reliable deliveries (Delivery): They are now working on improving the flexibility of their manufacturing systems. The Europeans and the Americans, on the other hand, have been aiming at narrowing the gap in their performance related to quality and delivery [3]. In other words, the Japanese are driven more by external competitive mandates, and the Europeans and the Americans by perceived internal deficiencies.

This is an important proposition, since it implies that the Europeans and the Americans are trying to catch up with the Japanese. We added a new question in the 1987 survey to look into this proposition. The question was aimed at obtaining a clearer picture of the perceived gaps between current manufacturing capabilities and their desired levels. Results are shown in Table 6.

**Table 6: Perceived Gaps in Manufacturing Capabilities**

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Degree of Importance

1. Introduce new products/design changes quickly (Design)
  1. Offer low prices (Cost)
  3. Make rapid volume change (Volume)
  3. Change production plans quickly (Plan)
  5. Provide fast delivery (Speed)
  5. Make dependable delivery promises (Delivery)
  7. Offer consistent reliable quality (Conformance)
  8. Provide high performance products (Performance)
  8. Offer a broad product line (Breadth)
- 

Looking at Table 4 and 6 together, one can see that, at least in 1987, the critical importance put on Conformance has more to do with its perceived external importance and less with the internal gap in capability. The same is true for Performance and Breadth. In other words, in terms of these capabilities, the European manufacturers consider themselves in a relatively good position: they are best at the capabilities which count most. It is in the relatively less important capabilities that they perceive a larger gap.

Whether this is due to a happy historical accident, result of hard work in the last few years, deliberate strategic exploitation of internal capabilities, or possibly complacency or arrogance, it is difficult to tell. But whatever the cause, the notion that the European manufacturers are putting highest priority on their perceived competitive weakness can not be supported by this data. If one may simplify, either they do not expect to be attacked in their relatively softer spots or they believe that a more effective way to compete is to enhance their current strengths.

Where the European manufacturers are seeing the largest gap in their capabilities are in offering low prices (Cost) and ability to change product design rapidly (Design). These happen to be the very two capabilities which the Japanese consistently in the last four years have put as their most important competitive capabilities. Does this mean that, in relative terms, the Japanese are basing their strategies more on "niche" capabilities--in this case low cost flexibility in manufacturing--hence not going on a head-on collision course with the Europeans? Or is it that the Europeans are just becoming aware of an important strategic gap in manufacturing capability--one which the Japanese saw as an opportunity a few years earlier, and as they did with their superior quality and delivery capabilities in manufacturing, they plan to use it for gaining competitive advantage in future?

Like most other observers, we subscribe to the second scenario [3], [4]. This scenario calls for more urgent attention to a reexamination of strategic priorities for development of the manufacturing capabilities that the Europeans are setting for themselves. We shall return to this point in the conclusion of this paper.

### **Improvement Programmes**

As in the previous years, the respondents were offered a list of 37 possible action programmes in manufacturing management and were asked to indicate (again on a seven-point scale) the degree of emphasis which they placed on each during the previous year and the degree of emphasis which they were placing in their plans for the next two years. The list was certainly not exhaustive (and of course the respondents could add more), but it did reflect five years of refinement by researchers and respondents of Manufacturing Futures Surveys in North America, Japan, and Europe.

In Table 7 the list of manufacturing improvement programmes is shown in the order of their average scores in the 1987 sample. Generally, the statistical significance of the difference in the rankings between two contiguous entries are rather small, but increases rapidly with more distance between them.

One way to summarise the contents of this table is to look at the pattern of various programmes which have been receiving greater attention. This can be done through statistical techniques or by simple observation. We have opted for the latter in this report, leaving the former for a different paper [5], but both yield similar general conclusions.

From the list of the action programmes during the past year, one may make the following observations:

- \* Management of quality has received high attention:  
Programmes for "Zero Defects", vendor quality, statistical quality control are fairly high on the list.
- \* There is a new look at the manufacturing process itself:  
With a view to reducing the production lead time, develop new process for new products, and improving the capability for introduction of new products.
- \* Which extends to reorganisation of manufacturing and clarification of the manufacturing strategy:  
Both have been emphasised last year.
- \* Motivation and training of the workforce continue to receive high attention:  
Supervisory training and direct labour motivation programmes are high on the list.

**TABLE 7 : Manufacturing Improvement Programmes  
1987 Ranks**

Last year	Plans for next two years
Worker safety	Zero defects
Manufacture lead-time reduction	Improve capab. for new product intro
Production/inventory control systems	Production/inventory control systems
Zero defects	Vendor quality
Supervisor training	Integrating mfg information systems
Manufacturing reorganisation	Direct labour motivation
Develop new processes for new products	Integr. info systems across functions
Vendor quality	Manufacture lead-time reduction
Improve capab. for new product intro.	Develop new process for new products
Direct labour motivation	Supervisor training
Integrating mfg information systems	Just-in-time
Define a manufacturing strategy	Statistical quality control
Statistical quality control	Define a manufacturing strategy
Preventive maintenance	Worker safety
Integr. info systems across functions	Computer-aided manufacturing
Change management/labour relations	Capacity expansion
Reduce the size of the workforce	Manufacturing reorganisation
Reduce set-up time	Preventive maintenance
Vendor lead-time reduction	Automating jobs
Develop new processes for old products	Vendor lead-time reduction
Automating jobs	Reduce the size of the workforce
Just-in-time	Computer-aided design
Give workers a broader range of tasks	Give workers a broader range of tasks
Computer-aided manufacturing	Value analysis/product redesign
Capacity expansion	Changing management/labour relations
Group technology	Develop new process for old products
Computer-aided design	Quality circles
Quality circles	Flexible manufacturing systems
Value analysis/product redesign	Narrow product lines/standardisation
Recondition physical plants	Group technology
Narrow product lines/standardisation	Give workers more planning responsibility
Give workers more planning respons.	Reconditioning physical plants
Flexible manufacturing systems	Capacity expansion
Introducing robots	Introducing robots
Reduce size of the manufact. units	Reduce size of the manufact. units
Plant relocation	Plant relocation
Closing plants	Closing plants

Programme for workers safety, while rather high in our previous surveys, jumped to the first place last year. We do not know exactly why, but suspect that a major and highly publicized industrial accident which occurred in Europe in the winter of 1986 (the period when most of the respondents answered our questionnaires) increased the awareness about industrial safety in general.

Compared to the last year's list, the higher emphasis of the rather broad range of quality management programmes is new. Some quality improvement programmes have been rather high in the previous years' lists, but the presence of so many of them high on this year's list suggests a more coherent and broad base approach (or belief) in the pursuit of total quality.

Also high on the list is the programme for improving the production/inventory control systems. This is well expected: production and inventory control is one of the central and basic activities in the management of manufacturing and covers a large spectrum of systems and techniques. In all our previous surveys, improvement of production and inventory control systems has received a high degree of attention, and we expect that it will always be high on the list of important improvement programmes in manufacturing.

Examination of the improvement plans for the next two years (Table 6) shows that the respondents plan to continue to emphasize most of the programmes which they have been emphasizing in the last year. The exceptions are:

- \* Worker safety drops considerably from its first place. It is still fairly high on the list, but closer to the place which it has been in the previous surveys.
- \* Integration of information systems--both within the manufacturing function and between manufacturing and other functions--are receiving more emphasis.
- \* Just-in-time programme is also receiving more attention.

In comparing the entire lists of past actions with the future plans (Table 6), one can observe which programmes are receiving the greatest increase of attention by the respondents. Table 8 shows the top twelve of these programmes.

**Table 8: Improvement Programmes receiving Highest Change of Emphasis**

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C A M

Integration of Manufacturing Information Systems

Integration of Information Systems across Functions

Just-in-Time

Product Redesign/Value Analysis

Direct Labour Motivation

New Product Introduction Capability

C A D

Vendor Quality

Zero Defects

Flexible Manufacturing Systems

Reducing Set-up Times

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There is a jump in the emphasis being placed on various programmes related to computer integrated manufacturing--cam, cad, integration of information systems; these technology-driven programmes are moving up in importance faster than others. A few years ago we witnessed a similar phenomenon with the more people-driven programmes (e.g., motivation of direct labor, quality circles). At the time, many of the manufacturers in our sample were undergoing substantial structural changes, such as reducing the size of the workforce and production capacity, and faced profitability problems (see next section). Perhaps those conditions put technology-driven programmes behind people-driven ones. Anyway, our data suggest existence of a new energy behind deployment of more technology in manufacturing in Europe.

**Performance**

Ninety-two percent of the business units in our 1987 sample reported a profit last year. This was a slightly lower percentage than in the 1986 survey (when it was 95 %), but much better than the crisis years of the early 1980's. To be more specific, five years ago, one-third of manufacturers in our sample reported a loss; four years ago this ratio dropped to one-fourth, three years ago to one-tenth, and in the last two years it has stayed lower than one-tenth.

The typical manufacturer in our 1987 sample (i.e., sample median), as mentioned earlier, had a profit equivalent to 5 % of sales last year. Profit level gives an important indication of performance, but to obtain more information, we asked the respondents for their achievements among eight measures. For each measure we asked two questions: What was the performance last year relative to goals, and how had the performance changed in the last three years.

These measures and their ranking according to the two questions are shown in Table 9. Quality and customer service stand out as the two measures along which the manufacturers performed best compared to goals. For the other measures, the scores were around the mid-point of the scale--meaning that the objectives were just met. So, on the whole, our respondents consider their performance last year to have been equal or better than the goals.

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**Table 9: Performance Measures**  
Ranks in 1987

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Last year's actual performance compared to goals *	Relative change in performance over the past 3 years **
Quality	Overall performance
Customer service	Quality
Unit production cost	Customer service
Overall performance	Profit
Profit	Return on investment
Inventory	Market share
Market share	Unit production cost
Return on investment	Inventory

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Note: (\*) The average scoring differences between the different performances are very limited. Only the first two stand out (i.e. most exceeding the goals) on the basis of a Wilcoxon matched pairs signed rank test.

(\*\*) The average scoring differences between the different performances are very limited. The first four are different from the last four on the basis of a Wilcoxon matched pairs signed rank test (i.e. performance along the first four measures improved most in the last three years).

But, aside from comparison of goals, have they actually improved their performance along these measures? The right column in Table 8 provides a ranking of the answers. Again the average for none of the measures was below the mid-point of the scale, which means the respondents, on the average, have not slipped along any of these measures over the last three years. In fact they have clearly improved their overall performance, quality, profit, and customer service, and have maintained the performance level along the other four measures (return on investment, market share, unit production cost, and inventory).

To test the correlation among the changes in performance over the last three years along the different measures, a principal component analysis was performed. Three factors provided explanation for 65 % of the variations in the responses: first, combination of overall performance, profit, market share, and return on investment; second, combination of quality and customer service, and third, combination of inventory and unit production cost. (In other words, if a respondent scored high on, say, overall performance, he was likely also to score high on profit, market share, and return on investment, and vice versa; the same for quality and customer service, etc.)

This indicates a rather high interdependence among the various performance measures: quality and customer service go together; unit cost and inventory performance improve together; and, more intuitively obvious, the various financial measures and market shares improve together. A corollary to this, we suggest, is that improvements in manufacturing cannot be realized by pursuing a single objective (such as lowering unit production costs); advances must be made on a broad front.

## ASSOCIATING PERFORMANCE WITH MANUFACTURING IMPROVEMENT PROGRAMMES

Who are the better performers in manufacturing and what do they do differently? This has been a recurring question every time we have reported the results of our surveys. Among the many measures of performance, two are frequently mentioned: profits and growth. Both profitability and growth are results of a multitude of decisions and conditions--many of which are far beyond the scope of our data base. The aim of our analysis here, therefore, is not to show which particular programmes are causing profitability or growth; that is not possible with our data. It is rather to show which action programmes in manufacturing are associated with profitability and growth.

### Programmes Associated with Profitability

Our 1987 data show a correlation between profitability of the business unit and a number of the 37 improvement programmes in manufacturing listed in our questionnaire. We used two different measures for profitability: First, the actual profit as percentage of sales of the business unit during last year, and second, the respondents rating of the relative change in profit performance over the last three years. The two measures themselves were highly correlated (i.e., those currently profitable were likely to have improved their profits in the last three years and vice versa). Therefore, as expected, the two sets of correlation analyses yielded consistent results.

Table 10 shows those programmes which show a correlation coefficient significantly different from zero with one or both of these measures. Our data show little about the strength of the association between any particular programme and profitability, but they do indicate the direction of the relationship. We have grouped these programmes into five as shown in Table 10.

**Table 10: Correlations between profit and manufacturing improvement programmes during last year.**

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Higher profit last year and/or improvement of profits in the last three years were associated with greater emphasis on:

A. People-Related Programmes:

- a) Giving workers a broader range of tasks\*
- b) Giving workers more planning responsibility\*
- c) Worker safety\*
- d) Motivation of direct labour\*

B. Structural Changes in Physical Plants:

- a) Expansion of capacity\*#
- b) Recondition the physical plant\*#

and negatively with:

- a) Manufacturing reorganisation\*
- b) Reduction of the size of the manufacturing unit\*#
- c) Plant Closures\*#

C. Quality Management:

- a) Preventive maintenance\*
- b) Zero-Defect\*
- c) Vendor quality\*

D. Automation and Computerisation

- a) Integration of information systems between manufacturing and other functions\*#
- b) Automating jobs#
- c) Group Technology\*

and negatively correlated with:

- a) Introduction of robots#
- b) Computer aided design#

E. Others

- a) Value Analysis\*
- b) Reduction of manufacturing lead time (negatively)#

\* Coefficient for correlation with last year's profit margin on sales significantly different from zero (at 95% confidence level).

# Coefficient for correlation with relative improvement in profits over the last three years significantly different from zero (at 95% confidence level).

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In a separate but similar analysis, we also examined the correlations between the action programmes planned for the next two years and these two measures of profitability. (For simplicity, we have not included the results of this analysis here.) Compared to "past" programmes (Table 9), fewer number of the "planned" programmes showed statistically significant correlations with our two profit measures (especially with the change of profits in the last three years), but all were among those which have been emphasized more in the "past" (i.e., last year). In other words, the more profitable companies, by and large, continue to put more emphasis on most of the programmes shown in Table 10.

Aside from the details that can be read directly from Table 9, we suggest the following broad observations:

1. Investments in physical plants (expanding capacity or renewal) receive greater attention, as one may expect, during periods of greater profitability; conversely, reorganisation or reduction of size of manufacturing (including closure of plants) are likely to be during a crisis in profitability. All this make good intuitive sense: changes in physical plants is a good indication of the firm's profitability.

2. The people-related programmes receive more attention with greater profitability. Is the profit due to them, or is it that when times are good the firm becomes more people-conscious? Unfortunately, our data does not allow us to answer this question. What is clear is that the profitable companies have paid and continue to pay more attention to their employees.

3. The profitable companies pay more attention to some of the quality-related programmes. These programmes--zero defects, preventive maintenance, and vendor quality--are internally consistent and follow the prescription of the experts of quality management. Again, the profitable companies plan to continue their efforts here.

4. The picture on the computerisation of manufacturing is mixed: On the one hand, the profitable ones seem to be emphasizing integration of their information systems between manufacturing and other functions, and on the other hand, the less profitable ones have been emphasizing computer aided design and introduction of robots. Questions similar to the ones raised for the people-oriented programmes (above) can also be raised here: Are these the causes or the effects? For example, does the introduction of robots, as some suggest [6], reduce the profitability in the short term (and that is what we are observing), or is the loss of profitability forcing the firm to robotise? Again our data does not provide the answer, but only rather intriguing associations.

## Programmes Associated with Growth

Similar to the analysis for profitability, using the growth rate of the sales of the business unit in terms of physical units during last year as the measure of growth, we examined correlation between growth and the manufacturing improvement programmes which had been emphasized during last year. Seven, out of the 37, showed a coefficient of correlation which was significantly (at 95% level) different from zero. Three of them were expected: Higher growth was associated with greater emphasis of capacity expansion programmes, and lower growth with the emphasis of plant closures and reduction of the size of the manufacturing units. The other four, however, were not as obvious.

Two of them were related to quality: Faster growing companies seem to be emphasizing zero defect and vendor quality programmes more than slower ones. The third was supervisory training: The slower growing companies emphasized it more. And the fourth one was reduction of setup times in manufacturing: Again, the slower growing companies emphasized it more. The reason why the slower growing companies carry out less of the quality related programmes and more supervisory training and set up time reduction, is not intuitively obvious.

The quality-related programmes continue to be on the list of the plans for the next two years which are correlated with growth (i.e., faster growing companies plan to emphasize them more in the next two years), but not the other two. In other words, we do not discern a difference in the plans for supervisory training and setup time reduction programmes among high and low growth companies. Does this mean that the intentions related to these programmes are similar, but in reality the pressure of growth pushes them to lower priorities?

## SUMMARY AND CONCLUSIONS

The data collected in our Manufacturing Futures Surveys are extensive, changing annually, and cover many industries and countries. In this paper we have presented some of these data and provided our interpretation of what they indicate. We realize that ours are not the only possible interpretations, and encourage the readers to draw their own conclusions from the summary data presented in this paper.

Nevertheless, having examined the entire data base for several years, and having tested many of our observations with various groups of researchers and senior executives, we offer the following as our new insights from the 1987 European Survey:

First, the average large European manufacturer, after being shaken up by a recurring profitability crisis and discovery of low-price high-quality competitive products in the early 80's, is showing more confidence. He feels that he has restructured its manufacturing and is closing the gap with respect to quality. But we see a danger of becoming complacent at the expense of not preparing for the next competitive battle driven by manufacturing flexibility. He sees the gap in its present capability in this respect, but so far has not attached a high priority to close it.

Second, the average European large manufacturer seems to be focusing more on the deployment of technology in his manufacturing management systems. Pursuit of many of the technology-driven improvement programmes--such as computer-aided manufacturing, computer-aided design, robotisation, integration of manufacturing information systems--seem to be associated with periods of low profitability. This confirms the standing proposition that these programmes reduce profitability in the short term. If the current trend in the emphasis of these technology-driven programmes continue, since many can be done in excess, we expect to find the average large European manufacturer more frustrated with financial returns of his factories next year.

Third, programmes for improvement of performance in manufacturing need to assault a wide front. The better performers are generally more aggressive in pushing a multitude of programmes in manufacturing management--focusing on the workforce, quality, technology, scheduling, inventory and information systems in production. Improvements in various manufacturing capabilities are in some respects cumulative--as opposed to being tradeoffs--and tend to build on each other.

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