FOCAL POINTS IN MANUFACTURING STRATEGY: COMPARING THE SPANISH CASE WITH AMERICAN AND OTHER EUROPEAN MANUFACTURERS

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1. INTRODUCTION: STRATEGIC RELEVANCE OF MANUFACTURING

For a long time most companies have conceded little importance to manufacturing activities and have relegated them to a secondary position compared to the other departments or functional areas; in the same way, they have maintained efficiency as the main objective of their production departments. Nevertheless, from the Seventies onwards, academics and practitioners have begun to be noted for their change in attitude towards manufacturing which is in a stage of transition and restructuring. In this sense, the role of production in the planning and implementing of the company's competitive strategy gains importance; at the same time, new forms of competing in the global markets other than cost or efficiency are being defined.

Professor Wickham Skinner was the first to articulate and propound the concept of manufacturing strategy used to avoid the isolation of manufacturing from the company's competitive strategy [Skinner (1969)][1]. The studies on the strategic nature of manufacturing have their origin in the seminal work of this author and consider that production management should not be limited to neutralising the potentially negative effects of the production process on the competitive strategy, but rather can be a fundamental cornerstone for this strategy, at least on an equal basis with the rest of the departments or functional areas.

At the present time, given the dynamism and uncertainty of the competitive environment, companies are faced with the need to obtain new sources of advantages over their competitors and, in this sense, a great number of them recognise the strategic role of the production function and become aware of its potential contribution to business success. In consequence, these companies are developing manufacturing strategies which allow them to strengthen their competitive strategies. The success of manufacturing strategies takes the form of developing resources and capabilities

[1] Wickham Skinner's seminal work on the concept of a manufacturing strategy was published in 1969 in the Harvard Business Review, entitled "Manufacturing — Missing Link in Corporate Strategy".

which arise from implementing different manufacturing policies (coherent with the competitive strategy) and which provide the company with lasting advantages over their competitors. It is considered that the development of manufacturing-related resources and capabilities, the explicit definition of the objectives in this area and the implementing of certain programmes, policies or action plans can provide the company with important advantages over its competitors. Hence, nowadays, the production function is acquiring a renewed role as a fundamental strategic element in meeting customer needs world-wide.

The approach described justifies the interest currently aroused in companies by the strategic management of their manufacturing objectives and decisions or policies. Once the strategic relevance of manufacturing has been identified, the work is organised in the following way: the research aims, the methodology followed, the profile of the companies analysed, the manufacturing strategies of the companies in the Spanish sample, as well as the comparison of these results with the manufacturing strategies of American and other European companies are presented; finally, the main conclusions of this work are drawn.

2. RESEARCH AIMS, METHODOLOGY AND PROFILE OF THE COMPANIES IN THE SAMPLE

The aim of this work is to analyse the manufacturing strategies of a sample of large Spanish industrial companies during the Nineties, that is to say, the current manufacturing competitive strengths, the objectives and policies maintained during the period 1992-93 and those foreseen for the period 1995-99. This paper forms part of a research project focused on the study of production strategic management in the large Spanish industrial company. The database used in this work is made up of information from a mail survey aimed at the largest industrial companies set up in Spain, size being measured in terms of the number of employees. The study population consists of the set of industrial companies (national or foreign) which have production plants in Spain and, which in the financial year 1994 (reference period of this research work) employed over 200 workers, in accordance with the list drawn up by Duns & Bradstreet Consultancy; then, the total size of the objective population is 1,104 companies. As the companies implement their manufacturing strategies at the level of the individual factory and considering that a company may have two or more production plants with different strategies, companies have been asked for information concerning each factory set up in Spain and thus, the questionnaire should be filled in by the operations managers.

Our questionnaire has been designed taking as a reference an international survey on the manufacturing strategies of the large manufacturing companies, carried out annually since 1983 as a base for the research project entitled “Global Manufacturing Futures Survey Project” (GMFSP).

This project is carried out by the Universities of Boston (USA), INSEAD (France) and Waseda-Tokyo (Japan) working in collaboration, each conducting the surveys on industrial companies of the United States, Europe and Asia, respectively. In particular, the definitive survey used in this work has been redesigned and adapted to the specific characteristics of the Spanish industrial companies based on (a) the survey used by INSEAD in 1994 as a base for "European Manufacturing Futures Survey Project" [INSEAD (1994)] —kindly provided by Professor Arnoud De Meyer without whose collaboration this study would not have been possible— and (b) the survey conducted from January to June 1990 by GMFSP on a sample of 500 companies from USA, Europe and Japan —a survey which was published in Miller *et al*. (1992)—.

Our research was initiated in May 1995 with the questionnaire design; this consists of 175 items, organised into three sections: (a) company profile, (b) competitive strategy and (c) manufacturing competitive strengths, objectives and policies. In order to check the suitability of the questionnaire design, in July 1995 a small sample of industrial companies was pretested. In September the definitive questionnaire was mailed to all of the companies forming the objective population or study universe. The questionnaires were sent initially to the chief executive officers (CEOs) of each of the companies so that they, in turn, might request their completion by the operations managers. Throughout the month of November the current situation of the surveys was monitored by a telephone follow-up, setting January 31, 1996 as the deadline for returning surveys and beginning information processing. A response rate of approximately 11% was obtained. In February 1996 a detailed review was made of the surveys received, which caused many of these to be rejected due to containing information which was incomplete or inconsistent with the research aims. Following this, the database was designed, consisting of information on 114 valid surveys[2]. Consequently, the sample error is 8.9% for a level of confidence of 95.5%, it being considered that the sample is sufficiently representative of the objective population. **TABLE 1** shows the technical data of the research work, that is to say, the objective population, geographical scope, time reference, sample unit and size, sample error and degree of reliability, duration of the field work and profile of the respondent.

TABLE 1: RESEARCH DATA

CHARACTERISTICS	SURVEY

[2] It is necessary to point out that four companies have provided two different surveys and one company has provided three surveys; the other companies collaborating in this research work have only completed one survey as (a) they have only one factory in Spain or (b) they consider that they develop similar strategies in all their factories located in Spain. Analysing the replies of the companies that filled in two or more surveys, it is observed that each of the surveys represents a strategic business unit with a specific competitive and manufacturing strategy. For this reason and along with the fact that the majority of the companies only fill in one survey in this work we identify each survey with a strategic business unit, following the same criterion adopted in similar international studies.

Universe, objective population or reference population	Industrial companies with over 200 employees N = 1,104 companies
Geographical field	All Spanish territory
Time reference	Annual = financial year of 1994
Sample unit	Strategic business unit
Sample size	114 valid surveys
Sample error	± 8.9%
Level of confidence	95.5%
Date of field work	July 4 1995 - January 31 1996
Informant manager	Operations or production manager / other corporate or factory manager

Almost 90% of the companies making up the sample have one or two factories in Spanish territory; the rest possess between three and ten production plants. Similarly, the sample includes companies representative of all the manufacturing sectors appearing in the *Standard Industrial Classification* (SIC 20-39) with the exception of manufacturers of tobacco (SIC 21) and leather and by-products (SIC 31). The industrial sectors with greater representation in the database are chemicals (20,4%), electrical and electronic machinery (13,3%), transportation equipment (13,3%) and the food industry (9,7%).

On the other hand, almost 60% of the companies analysed are devoted to transforming industrial products, with a high level of standardisation of products as well as entailing processes. In over 60% of the plants analysed, mass production processes were used aimed at efficiently manufacturing large volumes of standardised products in a narrow product line. Furthermore, materials are a relatively significant factor in the total costs, representing 55.8% of these costs; whereas direct labour costs make up 19.5%, general costs 18.2% and energy 6.5%. The relative cost contribution of direct workforce in the total manufacturing costs oscillates between 1 and 58%, 19.5% being its average value; in 54.3% of the companies analysed the costs of direct workforce do not exceed 20% of the total manufacturing costs. In similar studies to that presented in this paper, but performed in large American and other European industrial companies, it has been observed that the costs of materials oscillated between 53% and 57% of the total manufacturing costs; the costs of direct workforce represent between 17% and 20%; the energy costs are approximately 5% of the total costs; finally, general costs oscillate between 22% and 25% of the total manufacturing costs. In view of these data it is deduced that the Spanish companies maintain a manufacturing costs structure similar to that of the American and other European companies.

3. MANUFACTURING STRATEGIES OF THE LARGE SPANISH INDUSTRIAL COMPANY

The results of the analysis of the manufacturing strategies —or what amounts to the same, the manufacturing competitive strengths, objectives and policies— of the sample of large Spanish industrial companies in the Nineties are presented as follows. In this sense, five generic manufacturing priorities (that is cost, flexibility, quality, delivery and customer service) have been further specified into fourteen manufacturing objectives which are compiled in **TABLE 2**.

TABLE 2: MANUFACTURING PRIORITIES AND OBJECTIVES

MANUFACTURING PRIORITIES	MANUFACTURING OBJECTIVES
(1) EFFICIENCY	1. Low cost
(2) FLEXIBILITY	2. Rapid changes in current designs 3. Quick introduction of new products 4. Rapid volume changes 5. Rapid changes in product mix 6. Broad product line
(3) QUALITY	7. Defect-free products (or low defect rates) 8. Customer-perceived quality 9. Durable products
(4) DELIVERY	10. Fast deliveries 11. On-time or dependable deliveries
(5) CUSTOMER SERVICE	12. Broad product distribution 13. Effective after sales service 14. Product customisation service

In the same way, we have considered forty-five possible manufacturing policies which fit into at least one of the manufacturing policies of a structural and infrastructural nature identified in the literature; the classification of the different manufacturing policies into different levels is shown in **TABLE 3.**

Hence, taking 1994 as a time reference, we have analysed the situation of each company in relation to the fourteen objectives and forty-five manufacturing policies identified in the survey. For each of the manufacturing objectives we have evaluated the degree of strength or advantage the company has in 1994 over its best competitor, the importance given in the previous two years (1992-93) and the importance foreseen for the following five years (1995-99). In the same way, for each of the manufacturing policies we have evaluated the degree of emphasis placed in the previous two years (1992-93) and the emphasis foreseen for the following five years (1995-99). All of these valuations have been made by means of 7-point Likert scales. Since the study reference time period is the financial year of 1994, the manufacturing objectives and policies of the period 1995-99 represent the intentions or plans maintained by the companies for the objectives and policies to be applied in manufacturing.

TABLE 3: MANUFACTURING POLICIES AT DIFFERENT LEVELS

MANUFACTURING POLICIES		
POLICIES OF A STRUCTURAL NATURE	**Capacity**	1. Reconfiguration of factory lay-out 2. Factory reconditioning and/or reorganisation 3. Investments in plants, equipment and R&D 4. Expanding factory capacity 5. Reducing factory size
	Location	6. Factory location and relocation
	Technology	7. Computer Aided Design (CAD) 8. Computer Aided Manufacturing (CAM) 9. Robots 10. Flexible Manufacturing Systems (FMS) 11. Group Technology
	Vertical integration/relations with suppliers	12. Subcontracting part of the current manufacturing processes 13. Co-operation with suppliers 14. Integration of information systems with suppliers
POLICIES IN INFRASTRUCTURES	**Personnel management**	15. Job enlargement or enrichment (increase variety of tasks to be carried out by workers) 16. Worker empowerment (increase workers' responsibility) 17. Worker training 18. Management training 19. Inter-functional work teams
	Quality control and guarantee systems	20. Total Quality Management (TQM) 21. Zero defect programmes 22. Quality circles 23. Statistical quality control 24. Preventive maintenance 25. Continuous improvement of the current manufacturing processes
	Production and inventory planning and control systems	26. Definition of production objectives 27. Improvement in production and inventory control systems 28. Reduction in machine set-up time 29. Reduction in manufacturing lead time 30. *Just in time* purchases management 31. Activity Based Costing (ABC) 32. Development of new manufacturing performance measures
	Development of new products	33. Value analysis and product redesign 34. Concurrent engineering 35. Development of new products 36. Development of new processes for new products 37. Development of new processes for current products
	Organisational structure	38. Reducing workforce size 39. Decision decentralisation 40. Improving management-worker labour relations 41. Teamwork 42. Improving quality of working conditions. 43. Integrating production information systems 44. Integrating production information systems with distributors 45. Integration of information systems across other departments

For each manufacturing objective or policy a score of 1 implies that hardly any importance has been given, whereas a response of 7 reflects a heavy emphasis on this objective or policy. Therefore, if

the company is in a very unfavourable position compared to the best competitor as to a specific manufacturing objective, it is given a score of 1; if the company is in the best possible competitive situation it is evaluated with a 7. Given that the competitive position for each manufacturing objective has been measured on a scale from 1 to 7, a score of 1 is interpreted as a current lack of strength or advantage; a score of 4 represents a position identical to that of the best competitor; a score of 7 reflects the best possible competitive position. Although this is true, to avoid confusions, henceforth the term competitive strength will be used to define the position the company has in relation to its competitors in each manufacturing objective, whether a position of competitive strength, equality or weakness.

Definitively, the past and future manufacturing objectives and policies, as well as the current manufacturing competitive strengths of the companies under analysis have been identified. The coefficient used to check the reliability of the scale measuring the manufacturing objectives and policies considered is *Cronbach Alpha coefficient*[3]. In this sense, three different coefficients have been calculated: (a) for the items measuring the manufacturing objectives, (b) for the items measuring the manufacturing policies and (c) for the set of items measuring the manufacturing objectives and policies. **TABLE 4** compiles these three correlation coefficients, it being observed that the values obtained are very high and thus validating the reliability of the scale used. Consequently, it can be deduced that it is appropriate to measure the manufacturing objectives and policies of the companies under study by means of the items proposed.

TABLE 4: *CRONBACH ALPHA RELIABILITY COEFFICIENTS*

SCALE USED	*CRONBACH ALPHA COEFFICIENTS*
Scale of the 14 manufacturing objectives: a) Importance given in 1992-93. b) Strength or advantage in 1994 in relation to the best competitor. c) Importance foreseen for 1995-99. 42 ITEMS	0.9279
Scale of the 45 manufacturing policies: a) Importance given in 1992-93. b) Importance foreseen for 1995-99. 90 ITEMS	0.9689
Scale of the 14 objectives and 45 policies for manufacturing, as a whole: a) Importance given in 1992-93. b) Importance foreseen for 1995-99.	0.9727

[3] *Cronbach Alpha coefficient* is based on the internal consistency of a test; it is assumed that the items on a scale or test are positively correlated with the others because they are measuring the same reality. *Cronbach Alpha coefficient* has different interpretations: (a) it can be viewed as the correlation between the test or scale used and the rest of the possible tests or scales which contain the same number of items and can be constructed within a hypothetical universe of items which measure the same characteristic and (b) this coefficient shows the correlation between the score a person gives in the current scale or test and the score he would have given should he be asked the whole universe of possible items. As this is a correlation coefficient, its value oscillates between 0 and 1; the closer the value of this coefficient is to 1, the greater the reliability of the scale used.

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3.1. MANUFACTURING OBJECTIVES OR PRIORITIES

This section analyses the manufacturing objectives concerning three aspects: (a) current strength or advantage (1994) with respect to the best competitor, (b) importance given in the two years prior to the financial year 1994 (1992-93) and (c) importance foreseen for the following five years (1995-99).

TABLE 5 shows the hierarchy of the competitive strengths or advantages in relation to the fourteen manufacturing objectives. It is observed that the average of the scores of all the objectives is over 4 and so the companies consider themselves to be in a solid competitive position for each of the manufacturing objectives. The dependability and speed of deliveries is the main advantage of the companies analysed over their competitors; they consider that their manufacturing competitive strength or advantage is lower in relation to the different dimensions of flexibility.

TABLE 5: MANUFACTURING COMPETITIVE STRENGTHS OF THE SPANISH COMPANIES IN 1994

MANUFACTURING COMPETITIVE STRENGTHS	1994 AVERAGE
(1) On-time or dependable deliveries	**5.518**
(2) Fast deliveries	**5.474**
(3) Defect-free products	**5.474**
(4) Customer-perceived quality	**5.36**
(5) Product customisation service	**5.15**
(6) Durable products	**4.86**
(7) Low cost	**4.825**
(8) Effective after sales service	**4.798**
(9) Broad product distribution	**4.789**
(10) Rapid volume changes	**4.737**
(11) Broad product line	**4.728**
(12) Quick introduction of new products	**4.64**
(13) Rapid changes in designs	**4.518**
(14) Rapid changes in product mix	**4.5**

TABLE 6 shows the ranking of manufacturing priorities for the periods 1992-93 and 1995-99, in terms of the average score given to each manufacturing objective.

In the period 1992-93 the companies analysed have considered as the main manufacturing priority the obtaining of defect-free products and as the lowest priority the carrying out of rapid changes in current designs. The objectives related to flexibility in manufacturing —rapid changes in current designs, rapid changes in product mix, rapid changes in current production volumes, quick

introduction of new products and manufacturing of a broad product line— have received the least relative importance. Cost minimising or low cost manufacturing, which has traditionally been the main manufacturing objective, occupies fourth position in order of importance, preceded by defect-free products, fast deliveries and customer-perceived quality.

TABLE 6: MANUFACTURING OBJECTIVES OF THE SPANISH COMPANIES IN 1992-93 AND 1995-99

1992-93 MANUFACTURING OBJECTIVES	1995-99 MANUFACTURING OBJECTIVES
(1) Defect-free products	**(1)** Defect-free products
(2) Fast deliveries	**(2)** On-time or dependable deliveries
(3) Customer-perceived quality	**(3)** Customer-perceived quality
(4) Low cost	**(4)** Fast deliveries
(5) On-time or dependable deliveries	**(5)** Low cost
(6) Product customisation service	**(6)** Rapid changes in current designs
(7) Effective after sales service	**(7)** Product customisation service
(8) Broad product distribution	**(8)** Quick introduction of new products
(9) Durable products	**(9)** Effective after sales service
(10) Broad product line	**(10)** Rapid volume changes
(11) Quick introduction of new products	**(11)** Broad product distribution
(12) Rapid volume changes	**(12)** Broad product line
(13) Rapid changes in product mix	**(13)** Durable products
(14) Rapid changes in current designs	**(14)** Rapid changes in product mix

As to the manufacturing priorities for the period 1995-99, it is observed that the manufacturing of defect-free products is going to receive the priority attention followed by on-time or dependable deliveries, customer-perceived quality and fast deliveries.

If we compare the objectives of the periods before and after the study reference date, it is observed that the companies hope to maintain the same manufacturing priorities over the period 1992-99. On-time or dependable deliveries and the quick introduction of new products gain importance whereas the performing of rapid changes in current designs loses certain interest; it is generally hoped that the other objectives remain quite stable. Hence, the companies are going to focus their priorities on the objectives of quality and delivery and are going to give little importance to the aims related to flexibility; consequently, the Spanish companies foresee maintaining, in the future, the manufacturing objectives established in the period 1992-93.

3.2. MANUFACTURING POLICIES

This section analyses the 45 manufacturing policies identified, concerning two aspects: (a) importance given in 1992-93 and (b) the emphasis foreseen for the period 1995-99. **TABLE 7** shows the priority manufacturing policies in both periods.

TABLE 7: MANUFACTURING POLICIES OF THE SPANISH COMPANIES IN 1992-93 AND 1995-99

1992-93 MANUFACTURING POLICIES	1992-93 MANUFACTURING POLICIES
(1) Continuous improvement of the current manufacturing processes	**(1)** Total Quality Management (TQM)
(2) Definition of production objectives	**(2)** Worker empowerment
(3) Reduction in manufacturing lead time	**(3)** Reduction in manufacturing lead time
(4) Teamwork	**(4)** Definition of production objectives
(5) Improving management-worker labour relations	**(5)** Integration of production information systems
(6) Improvement in production and inventory control systems	**(6)** Continuous improvement of the current manufacturing processes
(7) Expanding factory capacity	**(7)** Teamwork
(8) Total Quality Management (TQM)	**(8)** Worker training
(9) Integration of production information systems	**(9)** Improvement in production and inventory control systems
(10) Investments in plants, equipment and R&D	**(10)** Zero defect programmes
(11) Factory reconditioning and/or reorganisation	**(11)** Management training
(12) Worker empowerment	**(12)** Integration of information systems across other departments
(13) Management training	**(13)** Preventive maintenance
(14) Development of new processes for current products	**(14)** Job enlargement
(15) Worker training	**(15)** Co-operation with suppliers
(16) Reduction in machine set-up time	**(16)** Reduction in machine set-up time
(17) Improving quality of working conditions	**(17)** Improving management-worker labour relations
(18) Job enlargement	**(18)** Statistical quality control
(19) Reconfiguration of factory lay-out	**(19)** Investments in plants, equipment and R&D
(20) Integration of information systems across other departments	**(20)** Improving quality of working conditions
(21) Zero defect programmes	**(21)** Development of new processes for current products
(22) Co-operation with suppliers	**(22)** Inter-functional work teams
(23) Preventive maintenance	**(23)** Factory reconditioning and/or reorganisation
(24) Statistical quality control	**(24)** Development of new products
(25) Development of new processes for new products	**(25)** Decision decentralisation
(26) Development of new products	**(26)** Development of new processes for new products
(27) Reducing workforce size	**(27)** Reconfiguration of factory lay-out
(28) Decision decentralisation	**(28)** Development of new manufacturing performance measures
(29) Inter-functional work teams	**(29)** Expanding factory capacity
(30) *Just in time* purchases management	**(30)** *Just in time* purchases management
(31) Computer Aided Design (CAD)	**(31)** Integration of information systems with suppliers
(32) Development of new manufacturing performance measures	**(32)** Activity Based Costing (ABC)
(33) Activity Based Costing (ABC)	**(33)** Value analysis and product redesign
(34) Value analysis and product redesign	**(34)** Computer Aided Design (CAD)
(35) Flexible Manufacturing Systems (FMS)	**(35)** Group Technology
(36) Integration of information systems with suppliers	**(36)** Quality circles
(37) Group Technology	**(37)** Reducing workforce size
(38) Computer Aided Manufacturing (CAM)	**(38)** Flexible Manufacturing Systems (FMS)
(39) Quality circles	**(39)** Computer Aided Manufacturing (CAM)
(40) Integration of production information systems with distributors	**(40)** Integration of production information systems with distributors
(41) Subcontracting part of the current manufacturing processes	**(41)** Concurrent engineering
(42) Concurrent engineering	**(42)** Subcontracting part of the current manufacturing processes
(43) Robots	**(43)** Robots
(44) Reducing factory size	**(44)** Reducing factory size

(45) Factory relocation	**(45)** Factory relocation

In the period 1992-93 the companies analysed have considered as priority the policies related to the continuous improvement of the current manufacturing processes, the definition of production objectives, manufacturing lead time reduction, teamwork and improving management-worker labour relations, to quote the five policies which receive greater emphasis in this period. On the other hand, the action plans related to the introduction of information technologies in the companies —that is to say, robots, Computer Aided Manufacturing (CAM), Group Technology, Flexible Manufacturing Systems (FMS) and Computer Aided Design (CAD)— or integration of information systems with suppliers and/or distributors do not enjoy particular emphasis in this period; in fact, the average score of the policies mentioned does not reach the value of 4 on a 7-point Likert scale. Furthermore, hardly any importance is given to the policies related to the relocation of the factory and the reduction of its size, which are the two lowest priorities of the period indicated. It is also observed that the companies analysed have not considered of particular importance any of the policies characteristic of *outstanding or world-class manufacturers* —that is to say, those companies which have achieved advantages over their competitors at an international level thanks to their superiority or excellence in manufacturing—, such as statistical quality control (priority 24), *just in time* purchases management (priority 30), quality circles (priority 39) or concurrent engineering (priority 42).

As to the importance or emphasis which is going to be given in the period 1995-99 to each of the 45 manufacturing policies considered, it is observed that among the ten priority policies for this period are Total Quality Management (TQM), worker empowerment, reducing manufacturing lead time, definition of production objectives, integration of production information systems, continuous improvement in current manufacturing processes, teamwork, worker training and zero defect programmes. All these manufacturing policies are action plans characteristic of *outstanding or world-class manufacturers*. On the other hand, policies which have the lowest priority for this period are production systems automation —CAD, Group Technology, FMS, CAM and robots— quality circles, reducing workforce size, integration of production information systems with the distributors, concurrent engineering, subcontracting part of the current manufacturing processes and the reduction in size and relocation of the factory.

The analysis of the ten manufacturing policies which have received most attention in the period 1992-93 allows us to state that only two of these ten policies are decisions of a structural type —expanding factory capacity and investments in plants, equipment and R&D—. In the same way, if the ten policies which have received least importance in this period are analysed, it is observed that seven of them are policies of a structural nature, that is to say, related to capacity or location of the

production plants —reduction in size and relocation of the factory—, to introduction of production technologies —robots, CAM and Group Technology— and to relationship with suppliers —subcontracting part of the current manufacturing processes and integrating information systems with suppliers—. On the other hand, the ten main manufacturing policies for the period 1995-99 affect infrastructures such as personnel, quality, introduction of new products, suppliers and production planning. Similarly, six of the ten policies which are going to receive the least emphasis are policies of a structural nature.

In accordance with these data the companies analysed have focused in the period 1992-93 on resolving questions related to infrastructures in manufacturing, rather than focusing on decisions of a structural type and, moreover, this tendency becomes more marked in the period 1995-99. This affirmation is coherent with the increasing importance that *outstanding or world-class manufacturers* are giving to the infrastructural decisions as opposed to the structural ones.

The definition of the production objectives is the second priority policy in order of importance in the period 1992-93 and the fourth priority for 1995-99. From this it is deduced that the Spanish companies seem to be preoccupied with the definition of a production strategy and, consequently, the hypothesis is strengthened that the companies analysed recognise the strategic character of the manufacturing operations.

It is also observed that among the priority manufacturing policies in the two periods under analysis (1992-93 and 1995-99) are the continuous improvement of the current manufacturing processes, the definition of the production objectives, the reduction in manufacturing lead time, teamwork, TQM, worker empowerment, personnel training and zero defect programmes; all these manufacturing policies are actions plans characteristic of *outstanding or world-class manufacturers*. Hence, it is possible to state that the Spanish companies have identified some of the policies which can provide them with competitive advantages in the area of manufacturing and, in this sense, they are incorporating substantial improvements. Although this is true, other manufacturing policies which are being applied by the best manufacturing companies at an international level are not among the priority production programmes of the companies analysed; in this sense, statistical quality control, *just in time* purchases management, quality circles or concurrent engineering are still not widely applied.

The TQM policies, zero defect programmes, preventive maintenance, job enlargement, worker empowerment, as well as the integration of information systems across the different departments are going to receive greater emphasis in the period 1995-99 (compared to the period 1992-93). Expanding factory capacity (which during the period 1992-93 is included among the ten main

manufacturing policies) is not expected to receive great attention in the period 1995-99 (priority 29). Despite these data, it is fitting to state that, on average, the manufacturing plans are not expected to undergo substantial modifications in the period 1992-99. Consequently, the companies analysed have no intention of significantly modifying, over the next few years, the manufacturing policies maintained in the previous period.

4. COMPARING THE SPANISH COMPANIES WITH THE EUROPEAN AND AMERICAN MANUFACTURERS

The present section compares the results obtained concerning the Spanish sample of manufacturers with the results of other similar studies performed in manufacturing companies located in Europe and the USA. With this aim, the two reports carried out in relation to the financial year 1994 as part of the "Global Manufacturing Futures Survey Project" (GMFSP) in American and European companies were taken as a reference [De Meyer (1994) and Kim (1994)], as well as other works containing the published results of the GMFSP of years prior to 1994 [De Meyer and Ferdows (1991), Miller *et al.* (1991) and Kim and Miller (1992)]. The results obtained for our sample are coherent with the tendencies observed in the European and American companies analysed in similar studies.

TABLE 8 compares the main competitive strengths in manufacturing presented in 1994 by the Spanish, European and American companies. The western manufacturers consider that they maintain strengths or advantages over their best competitors in the different objectives related to quality and delivery, as well as in the adaptation to customer orders —that is product customisation service, an objective to which little importance is given compared to the other manufacturing objectives—. Nevertheless, it is interesting to point out that obtaining low costs is not among the five main competitive strengths of any of the three groups of companies analysed.

TABLE 8: MANUFACTURING COMPETITIVE STRENGTHS OF THE SPANISH, EUROPEAN AND AMERICAN COMPANIES IN 1994

MANUFACTURING COMPETITIVE STRENGTHS		
SPANISH COMPANIES (1994)	**EUROPEAN COMPANIES (1994)**	**AMERICAN COMPANIES (1994)**
(1) On-time or dependable deliveries	**(1)** Reliable products	**(1)** Reliable products (product reliability)
(2) Fast deliveries	**(2)** Defect-free products (consistent quality)	**(2)** Defect-free products (conformance quality)
(3) Defect-free products	**(3)** Customer-perceived quality (high performance products)	**(3)** On-time deliveries
(4) Customer-perceived quality	**(4)** Durable products	**(4)** Customisation
(5) Product customisation service	**(5)** Fast deliveries	**(5)** Fast deliveries

TABLES 9 and 10 compare the manufacturing objectives of the Spanish, European and American companies in the years immediately before and immediately after 1994, respectively. Quality, delivery and to a lesser extent cost, are the main production objectives of the Spanish, European and American companies in the Nineties[4].

TABLE 9: PAST MANUFACTURING OBJECTIVES OF THE SPANISH, EUROPEAN AND AMERICAN COMPANIES

MANUFACTURING OBJECTIVES		
SPANISH COMPANIES (1992-93)	**EUROPEAN COMPANIES (1991-1993)**	**AMERICAN COMPANIES (1992-93)**
(1) Defect-free products	**(1)** Defect-free products (consistent quality)	**(1)** Defect-free products (conformance quality)
(2) Fast deliveries	**(2)** On-time or dependable deliveries	**(2)** Reliable products (product reliability)
(3) Customer-perceived quality	**(3)** Reliable products	**(3)** On-time deliveries
(4) Low cost	**(4)** Customer-perceived quality (high performance products)	**(4)** Customer-perceived quality (performance quality)
(5) On-time or dependable deliveries	**(5)** Fast deliveries	**(5)** Low cost

Basically, at the beginning of this decade the western companies have focused on the manufacturing of defect-free products (that is, on obtaining consistent quality or conformance quality) and little importance has been given to the different objectives related to flexibility and customer service; similarly, the companies foresee maintaining these priorities in the future.

TABLE 10: FUTURE MANUFACTURING OBJECTIVES OF THE SPANISH, EUROPEAN AND AMERICAN COMPANIES

MANUFACTURING OBJECTIVES		
SPANISH COMPANIES (1995-99)	**EUROPEAN COMPANIES (1995-99)**	**AMERICAN COMPANIES (1995-99)**
(1) Defect-free products	**(1)** Defect-free products (consistent quality)	**(1)** Defect-free products (conformance quality)
(2) On-time or dependable deliveries	**(2)** On-time or dependable deliveries	**(2)** On-time deliveries
(3) Customer-perceived quality	**(3)** Reliable products	**(3)** Reliable products (product reliability)
(4) Fast deliveries	**(4)** Fast deliveries	**(4)** Low cost
(5) Low cost	**(5)** Low cost (competition based on price)	**(5)** Fast deliveries

[4] In the studies performed in European and American companies, the following dimensions are included under the objective of quality: (a) low defect rates (consistent quality or conformance quality), (b) obtaining of dependable products (product reliability), (c) obtaining of high performance products perceived by the customer as high quality (customer-perceived quality or performance quality) and (d) manufacturing of durable products. Similarly, in relation to delivery, the dimensions of dependability (on-time or dependable deliveries) and speed (fast deliveries) are analysed.

TABLE 11 shows the main manufacturing policies implemented by the Spanish, European and American companies in the years immediately before 1994 (1992-93). Among these manufacturing policies which have been priorities in the western companies, worthy of note are the continuous improvement of the manufacturing processes and explicit definition of the manufacturing strategy or production objectives. The American and European manufacturers share the same priority emphasis on training programmes for workers and management, as well as worker empowerment.

TABLE 11: PAST MANUFACTURING POLICIES OF THE SPANISH, EUROPEAN AND AMERICAN COMPANIES

MANUFACTURING POLICIES		
SPANISH COMPANIES (1992-93)	**EUROPEAN COMPANIES (1992-93)**	**AMERICAN COMPANIES (1992-93)**
(1) Continuous improvement	**(1)** Worker empowerment	**(1)** Continuous improvement
(2) Definition of production objectives	**(2)** Continuous improvement	**(2)** Inter-functional work teams
(3) Reduction in manufacturing lead time	**(3)** Management training	**(3)** Worker training
(4) Teamwork	**(4)** Worker training	**(4)** Development of a manufacturing strategy
(5) Improvement in management-worker labour relations	**(5)** Improving quality of working conditions	**(5)** Management training
(6) Improvement in production and inventory control systems	**(6)** Development of a manufacturing strategy	**(6)** Worker empowerment
(7) Expanding factory capacity	**(7)** Integration of information systems across departments	**(7)** Reconfiguration of factory lay-out
(8) Total Quality Management (TQM)	**(8)** Integration of production information systems	**(8)** Training of supervisors
(9) Integration of production information systems	**(9)** Development of new manufacturing performance measures	**(9)** Factory reorganisation
(10) Investments in plants, equipment and R&D	**(10)** Factory reorganisation	**(10)** Statistical quality control

TABLE 12 compares the future manufacturing policies of the Spanish, European and American companies. Worker empowerment, the definition of a manufacturing strategy, the integration of production information systems, as well as the continuous improvement of the current manufacturing processes, are among the ten priority policies for the period 1995-99 of the manufacturers of the three groups indicated.

TABLE 12: FUTURE MANUFACTURING POLICIES OF THE SPANISH, EUROPEAN AND AMERICAN COMPANIES

MANUFACTURING POLICIES		
SPANISH COMPANIES (1995-99)	**EUROPEAN COMPANIES (1995-99)**	**AMERICAN COMPANIES (1995-1996)**
(1) Total Quality Management	**(1)** Continuous improvement	**(1)** Worker training
(2) Worker empowerment	**(2)** Worker empowerment	**(2)** Continuous improvement
(3) Reduction in manufacturing lead time	**(3)** Inter-functional work teams	**(3)** Development of a manufacturing strategy
(4) Definition of production objectives	**(4)** Development of a manufacturing strategy	**(4)** Inter-functional work teams
(5) Integration of production information systems	**(5)** Worker training	**(5)** Worker empowerment
(6) Continuous improvement	**(6)** Integration of information systems across departments	**(6)** Integration of manufacturing information systems
(7) Teamwork	**(7)** Training of supervisors	**(7)** Re-engineering
(8) Worker training	**(8)** Development of new manufacturing performance measures	**(8)** Management training
(9) Production and inventory control systems	**(9)** Integration of manufacturing information systems	**(9)** Integration of information systems across departments
(10) Zero defect programmes	**(10)** Teamwork	**(10)** Relations with suppliers

In the same way, the introduction of the different automation technologies is not among the priority manufacturing policies in the past nor is it foreseen for the future by the Spanish, European and American manufacturers analysed. Consequently, a certain negligence is observed towards the technological potential, forgetting to a certain extent that process technology is, and will remain to be, a key element in the competitive position of any company.

Nor do other manufacturing policies characteristic of *outstanding or world-class manufacturers*, such as *just in time* purchases management, reduction in manufacturing lead time, reduction in machine set-up time, zero defect programmes, quality circles, TQM, statistical quality control and preventive maintenance have, in general, priority nature in the western companies. On the other hand, the scarce emphasis given to all these manufacturing policies tending to improve the objectives of quality and delivery is not coherent with the priority emphasis that the western companies claim to give to these two objectives.

5. CONCLUSIONS

The aim of this work is to describe the situation of the large Spanish industrial company in the field of manufacturing strategic management; to this end, information has been obtained on 114 companies representative of large industrial companies set up in Spain, size being measured in terms of the number of employees. The main results or conclusions of this study are as follows:

- The production plants analysed focus on the manufacturing of defect-free products perceived by the customers as being of high quality and on the speed and fulfilment of deliveries. On average, low cost manufacturing is not the main priority and it is foreseen that it will even lose importance in the future. Similarly, the objectives related to flexibility receive less relative emphasis.

- Among the priority manufacturing policies in the Nineties are the continuous improvement of the current manufacturing processes, definition of the production objectives, reducing manufacturing lead time, teamwork, TQM, worker empowerment, worker training and zero defect programmes. All these manufacturing policies are action plans characteristic *of outstanding or world-class manufacturers.* For this reason, it is possible to state that the Spanish companies have identified those decisions which can provide them with competitive advantages in the manufacturing area and, in this sense, they are incorporating substantial improvements.

- Some manufacturing policies which are being applied by *outstanding or world-class manufacturers* are not among the priority production programmes of the Spanish companies studied. In this sense, statistical quality control, *just in time* purchases management, quality circles or concurrent engineering are not priorities widely maintained in the Spanish companies analysed. Nevertheless, it is fitting to point out that compared to the previous period the policies of TQM, zero defect programmes, preventive maintenance, job enlargement and worker empowerment, as well as the integration of information systems across different departments, seem to enjoy greater interest in the future.

- Comparing the experience of Spanish, European and American companies enables us to affirm the existence of similar manufacturing strategies (objectives and action plans or policies) in the large western industrial companies in the Nineties.

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