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COMPETITIVE POSITIONING AND INNOVATIVE EFFORTS IN SMALLER MANUFACTURING FIRMS

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ABSTRACT

This paper reports on the results of a study conducted in 455 smaller manufacturing firms. Its aim was to investigate the relationship between competitive positioning and innovative efforts as measured by R&D expenditures, process innovation, and use of patent data bases. Results indicate that a relationship does indeed exist and that firms which hold a stronger competitive position in terms of cost, quality, and diversity generally make greater efforts with regard to innovation. In fact, different competitive positionings correspond to differences in the type and nature of innovative efforts.

COMPETITIVE POSITIONING AND INNOVATIVE EFFORTS IN SMALLER MANUFACTURING FIRMS

1. Introduction and background

The current environment of market globalization, trade liberalization and rapid technological change poses new challenges to manufacturing firms. In this context, the innovative capacity of these firms assumes critical importance. This innovative capacity is not limited to efforts to introduce new products or services or even new procedures, efforts that have traditionally been evaluated in terms of investment in research and development (R&D) or of new technology acquisition. One must also be able to capitalize on the opportunities created by these new economic and technological conditions and know-how to develop distinctive competencies. This type of strategic thinking cannot be undertaken within a firm unless there is close congruence between the goals sought and the means put in place to achieve them. Business strategy and technological strategy must therefore be linked in such a way that the innovative effort can take into account both the firm's current competitive position and its desired position. For a small or medium-sized firm, this congruence between the end and the means could prove essential, given its greater vulnerability both to competitive pressures and to the financial risks associated with various forms of innovations.

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Many studies have investigated the relationship between certain types of innovative efforts such as R&D, and performance measures like sales growth (Franko, 1989; Morbey, 1988) productivity growth (Chakrabarti, 1990) or profitability (Morbey and Reithner, 1990).

Few have specifically focused on the relationship between strategic positioning and overall innovative efforts as pointed out by Schroeder (1990) and Miller (1988). Yet it is felt that this question should precede all others since the type and nature of innovative efforts must be a reflection of a firm's actual market positioning. In a recent study conducted in the biotechnology sector, Chakrabarti and Weisenfeld (1989) demonstrated that R&D expenditures are primarily associated with perceived environmental opportunities and potentials, while project costs and availability of funds are important secondary factors. It should be noted here that the sample of firms reported in that study was largely composed of smaller firms. In reporting the results of other sectorial studies on the chemical and textile industries, Chakrabarti (1990) further indicated that the nature of R&D spending, as well as process technology acquisitions, was largely dependent on the environment in which the firms were operating.

Thus, accepting as an initial premise that a firm exists first and foremost to meet the demands of the marketplace, we have chosen to conduct a study of the innovative efforts of small and medium-sized enterprises (SMEs) initially characterized in terms of their current competitive positioning. More specifically, the following research questions will be explored: Is the increased competitiveness of manufacturing SMEs associated with greater innovative efforts? Is there a link between competitive positioning and the nature of innovative efforts?

2. Manufacturing SMEs and competitive strategies

Although there are many studies on the competitive positioning of large corporations, due in part to the availability of data like the PIMS data base (Profit Impact of Market Strategies), very little empirical research has been done in the specific context of SMEs. Some notable exceptions include the work of Davig (1986) and of Miller and Toulouse (1986). As the specific nature of smaller companies with regard to certain environmental, structural and managerial aspects is well documented (Welsh and White, 1981), it can be expected that strategy, both in terms of process and of content, varies with firm size. In fact, smaller firms tend to have informal, inexplicit and intuitively derived strategies (Mintzberg, 1988) that are essentially driven by the CEO (Mintzberg, 1988; Miller and Toulouse, 1986) and "difficult to detach from the personality of their founders" (Adler, 1989:69). In the manufacturing sector, Ettlie and Penner-Hahn (1990: 153) recently reported that "only about 10% of North American firms have a manufacturing strategy". In this context, the presence of a clear and explicit generic strategy in the smaller manufacturing firms would be surprising. Therefore, in order to assess the strategic positionning of SMEs, comparative measures with respect to direct competitors on a number of competitive advantages appear to be both feasible and appropriate. Furthermore, because of the very nature of SMEs, some of the competitive advantages may be pursued more effectively by these firms. Smaller companies rarely choose to compete exclusively at the level of economies of scale but tend to compete more with regard to economies of scope. The crucial competitive strengths of SMEs lie in their knowledge of the needs of their customers, their ability to supply a specialized or unique product or service, their operating flexibility and their speed of adaptation to change. This may explain why differentiation and segmentation seem to be more favoured by smaller companies, allowing them to escape from the sort of strict competition on the basis of price practised by some large firms. Nevertheless, cost reduction is not neglected and it continues to be one of the strategies pursued by smaller firms.

The technological dimension of corporate strategy, although increasingly recognized as essential to the long-term survival and growth of manufacturing firms, does not actually receive much specific attention from senior managers (Clarke et al., 1989). As noted by these authors, technology strategy seems to be difficult to define and conceptualize and the technological strengths and weaknesses of different firms are hard to assess. It is therefore assumed that formal policies on technological innovation would be even harder to come by in SMEs and that quantifiable innovative efforts could be indicators of the degree of technological innovation attained by these firms.

3. Competitive positioning and innovative efforts in SMEs

SMEs, even without formal policies on technological innovation, implicitly emphasize efforts oriented towards the improvement or modification of the technical characteristics of a product (product innovation) or towards the adoption of a new manufacturing process or the introduction of new computer-based technologies (process innovation). The classical distinction between product and process innovation has been recognized in many previous studies (e.g. Leong et al., 1990; Adam and Swamidass, 1989; Kimberly, 1987). Excluded from this research are the types of administrative innovation that relate to the structures and practices and which in any case may be hard to distinguish from the other two classical forms of innovation especially in smaller firms.

In terms of product innovation, it would appear that, historically, smaller firms may have contributed greatly to the improvement of existing products and even the creation of new products (Acs and Audretsch, 1988; Rothwell, 1978). Nevertheless, the amounts of money dedicated to research and development are not large, and the existence of a laboratory or a research team is exceptional in the SME environment (Santarelli and Sterlacchini, 1990; Kao, 1983). Formalized R&D activities continue to be concentrated in the larger companies, as shown by the official data from the OECD and the empirical studies of Acs and Audretsch (1987, 1988). In smaller companies, these activities remain informal (Santarelli and Sterlacchini, 1990; Kleinknecht, 1987), often based on the creative talents of a few individuals including the owner/CEO himself (Kao, 1983). This may result in an underestimation of the amounts of money dedicated to R&D at least as they appear in official sources of information. It may also explain why it is so difficult to assess empirically amounts actually attributed to R&D. Not only are the internal accounting procedures inadequate (Kleinknecht, 1987), actual reporting of these figures may imply unnecessary time consuming administrative hastles. Within the framework of this study, we merely asked the owner/CEO to estimate the amount spent on R&D. While the cause and effect relationship between the amount spent on R&D and competitive positioning is far from obvious, it is nevertheless assumed that informal R&D activities could constitute a significant factor in determining this positioning. Given that R&D activities are at the very heart of the process of innovation, patents, which are considered to be the outcome of such activity, are also an indication of innovative efforts (Dror, 1989), although they do not necessarily translate into a competitive advantage (Sanders, 1971).

An integral part of the innovation process is the active search for information on the environment. Systematic scanning for external technical information is of utmost importance since innovative ideas are more likely to arise as sensitivity to the environment increases (Utterback, 1971; Aguilar, 1967). It is therefore proposed that a deliberated search activity aimed at acquiring technical information constitutes a valid indicator of the innovative efforts which may utlimately contribute to an improvement in a firm's competitive positioning.

A firm that wishes to maintain and improve a competitive position may also consider new computer-based manufacturing technologies. Specific strategic advantages have been associated with the adoption of these technologies: a larger flow of new products, greater customization of products, and shorter product life cycles (Buffa, 1985). To this list, other authors have added improved product quality, improved inventory turnovers and shortened delivery cycles (Meredith, 1987a; NRC, 1987; Skinner, 1984, 1985). All of these advantages enable firms to improve their competitive positions (Blois, 1988; Meredith, 1987a).

For smaller firms, technology adoption is indeed a crucial decision. Special concerns might be raised regarding their capacity to modernize their facilities in order to respond to the increasing competitive pressures expected in the coming decade (Schroeder et al., 1989). Admittedly, it would seem that the adoption of innovative production processes is the prerogative of large firms, given the necessity for a substantial capital investment and the skilled workforce required to install and operate the new technologies. Nevertheless, this assumption is increasingly being challenged on the grounds that the introduction of new manufacturing technologies has contributed to making small-scale production economically feasible and therefore accessible to smaller firms (Carlsson, 1991; Carlsson et al., 1991). Meredith (1987b) has further justified the adoption of technology by smaller businesses, suggesting that such firms, less hampered by organizational inertia than large ones, can react more quickly to internal and external pressures. Because managers, even at the highest levels, are less isolated in the organizational hierarchy, they are able to play a greater role in the process of introducing the technology. Lefebvre et al. (1990) also claim that new technology permits smaller firms to become more flexible, allowing them to respond more rapidly to customers' needs while improving the quality and variety of their products and increasing "made-to-order" production. In fact, the type and range of benefits realized by manufacturing SMEs correspond to the advantages smaller firms are accustomed to exploit (Lefebvre et al., 1991a; Meredith, 1987b). Furthermore, it would appear that, as a firm gains experience with technology, the type and range of benefits realized are modified, moving in the direction of putting more weight on intangible benefits such as quality of customer services and company image (Lefebvre et al., 1991b).

4. Method

Sample

A systematic sample was drawn from an up-to-date government list of manufacturing firms operating in Quebec, the second largest province in Canada by population. A pre-tested, self-administered questionnaire was sent to the CEO of each of the firms selected. The CEO was chosen as respondent because of his/her knowledge of the firm's operations (Hambrick, 1981) and influence in selecting the strategic direction (Miller and Toulouse, 1986).

No follow-up was done. Respondents to the survey came from every major sector of industrial activity, including furniture manufacturing, pulp and paper, plastics, food, chemicals, electronics and metals. The sectorial representation does not differ from that observed in the population of manufacturing firms operating in Quebec (goodness of fit test $\chi^2 = 11.87$, $p = .221$). Annual sales of the firms in the sample amounted to over 31 million dollars, which is not surprising given that 97% of all manufacturing firms operating in Quebec - and in Canada for that matter - are small firms with fewer than 200 employees. The responding firms are also representative of the actual size distribution of firms in the population, although there is a small bias in favour of larger firms. For the purpose of this study, only manufacturing firms with fewer than 200 employees were analyzed. This upper limit corresponds to one of the accepted definitions of SMEs (Stanworth et al., 1982). All subsequent statistical analysis is carried out on the 445 responding firms that met this criterion.

Due to the survey approach used in this study, data should be interpreted keeping in mind certain limitations. The self-reporting procedure by a single respondent may have introduced certain biases. This procedure may also have induced the overrepresentation effect noticed by Kleinknecht (1989), who claims that firms may be more inclined to respond to a survey on innovation if they feel they are innovative in the first place. In that respect, official sources of published data on technological indicators may be more reliable in terms of statistical inference to the population, but they do not address the more specific issues relating to market positioning, strategic orientation and innovative efforts. The purpose of this study is not to provide accurate information on the innovative efforts of Canadian SMEs but rather to analyse relationships that may exist between various innovative efforts and strategic positioning in smaller manufacturing firms.

Research variables

Two sets of research variables were retained. The first set allows one to determine the strategic positioning of the firms and is based on variables similar to those found in PIMS (Profit Impact of Market Strategies). The firm's CEO must thus position his company in relation to its closest competitors along the following dimensions: product price, production cost, product quality, product image, product diversity, quality of customer service and frequency of introducing new products. Relative financial performance (adapted from Lippman and McCardle, 1987) is an additional variable that we have retained to validate the strategic positioning of companies.

The second set of variables corresponds to certain indicators of the innovative effort of a company. Special attention was paid to providing a comprehensive measure of innovative efforts comprising numerous indicators. This approach has been used successfully by Chakrabarti and Halperin (1990) who have demonstrated that a correlation exists between the different indicators of technical productivity. The first indicator, the percentage of sales devoted to research and development, is a standard measure and allows one to derive a normalized R&D intensity measurement. It has, however, been argued that R&D expenditure per employee might be a better proxy for innovative efforts (Hill and Snell, 1989) because of the high fluctuations registered in annual sales, although the same argument might be made for the number of employees, which in SMEs is extremely variable due to factors such as seasonal demand and market fluctuations. Yet, in the context of a SME, R&D investments do, after all, tend to relate to informal R&D activities, corresponding to the time invested by a few individuals, often including the owner/CEO.

This phenomenon was recognized in an earlier on-site exploratory study conducted in 44 small manufacturing firms using semi-structured interviews (Lefebvre et al., 1989). The other classical measure retained in the study corresponds to the company's holding of at least one patent. Information relating to patents was further qualified by looking into the reasons evoked by firms for consulting patent data bases. This, we feel, provides an indication of the underlying strategic actions motivating this search of external technical and market information.

With regard to innovations in the manufacturing process, an innovation score is calculated for production technologies. The actual score derived takes into account the fact that a process innovation may be either radical or incremental, depending on the organizational and industrial contexts (Dewar and Dutton, 1986; Ettlie et al., 1984). To determine the incremental or radical nature of each process innovation, a panel of 40 experts familiar with the computerized processes found in smaller manufacturing firms was asked to classify on a scale of 1 to 7 (where 1 = process innovations of a more incremental nature and 7 = process innovations of a more radical nature) each of the computerized process innovations. A weighted sum for each firm was then calculated based on the mean attributed by the panel of experts to each of the process innovations, taking into account the presence or absence of each. This weighted sum is considered a proxy of the relative degree of innovativeness of a firm with respect to the adoption of computer-based production technologies. This definition of the degree of process innovativeness permits a more subtle gradation, capturing both a traditional measure (number of process innovations) and the nature of these innovations. The scores obtained in this manner appear preferable to the well-known Khandwalla score, based on fixed pre-established criteria that do not take into account the organizational context.

5. Results and discussion

Multivariate analysis in the form of factor analysis using varimax rotation was conducted on all competitive positioning variables in order to derive orthogonal factors and eliminate multicollinearity (Table I). Cluster analysis was then performed on these factors, resulting in three distinct groups of firms (Table II). Further analysis attempted to identify distinctive innovative efforts associated with each cluster (Tables III and IV).

TABLE I

Results of factor analysis using varimax rotation
(n = 445)

STRATEGIC POSTURE VARIABLES:	FACTOR 1: Quality	FACTOR 2: Diversity	FACTOR 3: Cost
Relative price of products	0.21	0.01	0.84
Relative costs of production	- 0.11	0.03	0.87
Relative product quality	0.87	0.05	0.09
Relative product image	0.82	0.18	0.10
Relative product diversity	0.28	0.83	0.03
Relative quality of customer services	0.67	0.26	- 0.08
Relative frequency of new product introduction	0.11	0.89	0.01
Cumulative percentage of explained variance	36.8 %	57.6 %	72.9 %

1. Kaiser-Meyer-Olkin measure = 0.67 (sample adequacy test).
2. Variables measured on 5 point Likert scales (1 = very inferior to direct competitors and 5 = very superior to direct competitors).

The results of the factor analysis with varimax rotation conducted on the competitive positioning variables suggest the presence of three very distinct factors (Table I). The first, which accounts for 37% of total explained variance, is largely loaded with measures of the quality (of products and services) and image of products, and accounts for what we have termed the "quality" factor. The second deals with the "diversity" of products and the frequency of new product introduction. The third factor relates to "cost" dimensions, namely production costs and product price. The three factors thus derived - quality, diversity and cost - are consistent with dimensions that have previously been identified as important for the competitiveness of the smaller manufacturing firms. Globally, they account for 73% of total explained variance in our sample of 445 small manufacturing firms.

TABLE II

Results of cluster analysis

COMPETITIVE DIMENSIONS	TOTAL (n=445)	GROUP 1 "worst" (n_1=104)	GROUP 2 "niche" (n_2=199)	GROUP 3 "best" (n_3=142)	P[1]
Factor 1: QUALITY	4.09	3.24	4.40	4.28	.0000 ***
Factor 2: DIVERSITY	3.38	3.05	3.47	3.51	.0001 ***
Factor 3: COST	3.02	3.04	3.48	2.36	.0000 ***
Financial performance % d'exportation	3.30	3.22	3.43	3.65	.0003 ***

1. Level of significance for the Kruskal-Wallis test:

*** $p < .01$
** $p < .05$
* $p < .10$

When cluster analysis is performed on these factors, three groups of firms can be distinguished (Table II). The first group, which scores low on all three dimensions of quality, diversity and cost, would appear to constitute the least competitive firms since they have no identifiable explicit strategy, and seem to be lagging behind on all three competitive dimensions. The second group focuses on quality and diversity while maintaining high costs. This would appear to correspond to firms operating in a specific "niche", which would explain why they are able to obtain higher product prices and provide high quality products and customer service. Firms belonging in this second group are able to offer a service or product perceived as unique by customers. The third group is quite similar to the second with respect to both quality and diversity but differs considerably on the cost dimension,

TABLE III

Competitive strategies and innovative efforts
(Comparison between the three groups)

INNOVATIVE EFFORTS	GROUP 1 "worst" ($n_1=104$)	GROUP 2 "niche" ($n_2=199$)	GROUP 3 "best" ($n_3=142$)	p^1 for the 3 groups	p^2 for gr. 1 vs. gr. 2	p^2 for gr. 1 vs. gr. 3	p^2 for gr. 2 vs. gr. 3
R&D as a percentage of annual sales[3]	2.43	3.21	3.62	0.093 *	0.031 **	0.022 **	0.342
Proportion of firms holding at least one patent (%)	6.7	12.6	10.6	0.292	0.058 *	0.149	0.285
Proportion of firms using patent information[4]	7.7	14.6	13.4	0.217	0.041 **	0.079 *	0.377
Score of innovativeness[5] for computer-based production technologies	1.27	1.93	2.39	0.123	0.072 *	0.020 **	0.204

1. Level of significance for the Kruskal-Wallis test (continuous variables) and for the χ^2 test (nominal variables)

   *** $p < .01$
   ** $p < .05$
   * $p < .10$

2. Level of significance for the Mann-Whitney test (continuous variables) and for the χ^2 test (nominal variables)

   *** $p < .01$
   ** $p < .05$
   * $p < .10$

3. Including informal activities.

4. It should be noted that only a few of the firms consulting patent data bases actually make use of this information for technical or commercial reasons.

5. This score is a composite measure of the number of computer-based manufacturing applications and the degree of radicalness of these applications as assessed by a panel of experts.

which probably constitutes its greatest competitive advantage. In other words, competing on product cost through efficient production, while maintaining high quality and diversity is the characteristic profile of the firms in this group.

Comparative analysis of the three groups leads us to qualify the first group as the least competitive and term them the "worst", whereas the second group are the "niche" group and the third group the "best" group, since they appear to be efficient producers in terms of cost, diversity and quality of products, and to be very effective in terms of service quality and product image. This analysis is confirmed by the financial performance measures of the three groups presented in Table 2 where the differences are found to be statistically significant at p = .0003.

TABLE IV

Motives for consulting patent data bases
(Comparison between the three groups)

MOTIVES FOR CONSULTING PATENT DATA BASES	GROUP 1 "worst" ($n_1 = 19$)	GROUP 2 "niche" ($n_2 = 53$)	GROUP 3 "best" ($n_3 = 42$)
As a source of technical information	32.1 %	46.0 %	49.1 %
To follow activities of competitors	35.7 %	19.0 %	28.3 %
To prevent duplication of R&D efforts	14.3 %	25.4 %	28.3 %
To develop new products	25.0 %	41.3 %	37.7 %
To develop new processes	10.3 %	15.9 %	22.6 %
To patent a new product or process	14.3 %	30.2 %	20.8 %

Further characterization of the three groups with respect to the indicators of innovativeness (Table III) reveals interesting findings that appear consistent with the results of the previous table. The "worst" firms do not show any evidence of making particular efforts with regard to R&D, patents or use of patent information, or the adoption of advanced manufacturing technologies. This is in sharp contrast with the "best" firms, whose innovativeness score is the highest, which may explain how they can maintain low production costs and high product diversity. The R&D level is also the strongest in these firms, and we may speculate that this further is closely related to process innovation. The proportion of firms in this group holding patents, while being quite acceptable, is not as high as that found in the second group. This last finding seems reasonable since the second group of firms, operating, as they do, in a "niche", could be expected to rely more heavily on product differentiation, which is likely to be associated with the holding of patents. These firms also demonstrate a proportionately greater percentage of users of patent information. In fact, additional analysis of the principal reasons or motivations for consulting patent information revealed interesting results which should nevertheless be considered as being purely descriptive since sample size drops somewhat drastically (Table IV). The number one motivation indicated by the "niche" firms was to consult patents as a source of technical information, while their second and third most important reasons were to develop new products and to patent products or processes. This suggests that those firms which do consult patent information are strongly engaged in a systematic search of technical information in order to keep abreast of new developments while remaining actively involved in the development of new products, as could be expected of firms in a "niche" position. This suggests a much more aggressive behaviour than the one found in the "worst" firms, which seem to be primarily in a defensive position, following the activities of competitors. As for the group which we termed the "best", they definitely demonstrate a strong preoccupation with new product development and the search for technical information. Yet, of all three groups of firms, this group is also the most preoccupied with the development of new processes, which may explain why these firms compete most effectively on all dimensions.

6. Conclusion

Clearly, more empirical research, in the form of longitudinal studies, is required for us to understand the underlying dimensions of innovation and strategy in smaller manufacturing firms.

The results of this empirical research tend to support the assumption that a link exists between a firm's competitive positioning and its innovative efforts. This finding indicates, that, in order to better understand a small firm's innovation strategy, efforts should first be made to understand the grounds on which that firm has chosen to compete. Smaller firms need to be constantly preoccupied with market signals if they wish to compete, and even to survive. Capital scarcity and tight cashflow constitute important constraints for SMEs. For these reasons, the time horizon within which they operate is usually much shorter than that affecting their larger counterparts. In that respect, a firm's innovation strategy must be closely fitted to its market strategy in order to derive, in a reasonable time frame, the full benefits that innovation may provide. Yet achieving and maintaining a distinctive competitive strategy requires differentiated innovative efforts. It has been shown here that efforts with respect to R&D, patents, and advanced manufacturing technology adoption differ according to the competitive positioning of a firm; although these results are not completely conclusive, they nevertheless indicate differences in innovative behaviour. This leads us to believe that, for the smaller manufacturing firms, competitive positioning drives, to a large extent, innovative efforts.

REFERENCES

AGUILAR, F.J. (1967), Scanning the Business Environment, Macmillan, New-York.

ACS, Z.J. and D.B. AUDRETSCH (1987), "Innovation, Market Structure and Firm Size", Review of Economics and Statistics, 69 (4), pp. 567-574.

ACS, Z.J. and D.B. AUDRETSCH (1988), "Innovation and Firm Size in Manufacturing", Technovation, 7, pp. 197-210.

ADAM, E.E. and P.M. SWAMIDASS (1989), "Assessing Operations Management from a Strategic Perspective", Journal of Management, 15 (2), pp. 181-203.

ADLER, P.S. (1989b), "Technology Strategy: A Guide to the Literatures" in R.S. Rosembloom and R.A. Burgelman (eds), Technological Innovation, Management and Policy, 4, JAI Press, pp. 25-151.

BLOIS, K.J. (1988), "Automated Manufacturing Creates Market Opportunities", Journal of General Management, 13 (4), pp. 57-73.

BUFFA, E.S. (1985), "Meeting the Competitive Challenge with Manufacturing Strategy", National Productivity Review, Spring, pp. 155-169.

CARLSSON, B. (1991), The Rise of Small Business: Causes and Consequences, working paper,
Dept. of Economics, Case Western Reserve University, Cleveland.

CARLSSON, B., D.B. AUDRETSCH and Z.J. ACS (1991), "Flexible Technology and Plant Size: U.S. Manufacturing and Metalworking Industries", working paper, Case Western Reserve University, Cleveland.

CHAKRABARTI, A.K. and U. WEISENFELD (1989), "Marketing and R & D Strategies for Biotechnology Firms in the USA", Technology Analysis & Strategic Management, 1 (4), pp. 357-366.

CHAKRABARTI, A.K. and M.R. HALPERIN (1990), "Technical Performance and Firm Size: Analysis of Patents and Publications of U.S. Firms", Small Business Economics, 2, pp. 183-190.

CHAKRABARTI, A.K. (1990), "Innovation and Productivity: An Analysis of the Chemical, Textiles and Machine Tool Industries in the U.S.", Research Policy, 19, pp. 257-269.

CLARKE, K., D. FORD and M. SAREN (1989), "Company Technology Strategy", R & D Management, 19 (3), pp. 215-229

DAVIG, W. (1986), "Business Strategies in Smaller Manufacturing Firms", Journal of Small Business Management, January, pp. 38-46.

DEWAR, R.D. and J.E. DUTTON (1986), "The Adoption of Radical and Incremental Innovations: An Empirical Analysis", Management Science, 32(11), pp. 1422-1433.

DROR, I. (1989), "Technology Innovation Indicators", R & D Management, 19 (3), pp. 243-249.

ETTLIE, J.E., W.P. BRIDGES and R.D. O'KEEFE (1984), "Organization Strategy and Structural Differences for Radical Versus Incremental Innovation", Management Science, 30(6), pp. 682-695.

ETTLIE, J.E. and J.D. PENNER-HAHN (1990), "Focus, Modernization and Manufacturing Technology Policy", in J.E. Ettlie, M.C. Burnstein and A. Fiegenbaum (eds.), Manufacturing Strategy, Kluwer Academic Publishers, Boston, pp. 153-164.

FRANKO, L.G. (1989), "Global Corporate Competition: Who's Winning, Who's Losing, and the R & D Factor as One Reason Why", Strategic Management Journal, 10, pp. 449-474.

HAMBRICK, D.C. (1981), "Strategic Awarness Within Top Management Teams", Strategic Management Journal, 2, pp. 263-279.

HILL, C.W.L. and S.A. SNELL (1989), "Effects of Ownership Structure and Control on Corporate Productivity", Academy of Management Journal, 32 (1), pp. 25-46.

KAO, R.W. (1983), "Research and Development for Small Business", Journal of Small Business Canada, 1 (1), pp. 25-30.

KIMBERLY, J.R. (1987), "Organizational and Contextual Influences on the Diffusion of Technological Innovation", in J.M. Pennings and A. Buitendam (eds.), New Technology as Organizational Innovation, Ballinger Publishing Company, Cambridge, MA., pp. 237-260.

KLEINKNECHT, A. (1987), "Measuring R & D in Small Firms: How Much Are we Missing ?", Journal of Industrial Economics, 36(2), pp. 253-256.

KLEINKNECHT, A. (1989), "Firm Size and Innovation", Small Business Economics, 1, pp. 215-222.

LEFEBVRE, L.A., E. LEFEBVRE and J. DUCHARME (1989), "Introduction and Use of Computers in Small Business: A Study of the Perceptions and Expectations of Managers", Department of Communications, Government of Canada, MCC - CWARC - DLR/6-009, Ottawa.

LEFEBVRE, L.A., E. LEFEBVRE and R. POUPART (1990), "The Shape of the New Winner: Innovativeness and the Strategic Edge in Small Firms", National Productivity Review, 9, (3), pp. 313-320.

LEFEBVRE, L.A., E. LEFEBVRE and D. COLIN (1991a), "Process Innovation, Productivity and Competitiveness in Smaller Manufacturing Firms", Canadian Journal of Administrative Sciences, 8 (1), pp. 19-28.

LEFEBVRE, L.A., J. HARVEY and E. LEFEBVRE (1991b), "Technological Experience and the Technology Adoption Decisions in Small Manufacturing Firms", R & D Management, 21 (3), pp. 241-249.

LEONG, G.K., D.L. SNYDER and P.T. WARD (1990), "Research in the Process and Content of Manufacturing Strategy", Omega, 18 (2), pp. 109-122.

LIPPMAN, S.A. and K.F. McCARDLE (1987), "Does Cheaper, Faster or Better Imply Sooner in the Timing of Innovation Decisions ?", Management Science, 33 (8), August, pp. 1058-1064.

MEREDITH, J. (1987a), "The Strategic Advantages of the Factory of the Future", California Management Review, 29 (3), pp. 27-41.

MEREDITH, J. (1987b), "The Strategic Advantages of New Manufacturing Technologies for Small Firms", Strategic Management Journal, 8, pp. 249-258.

MILLER, D. and J.-M. TOULOUSE (1986), "Chief Executive Personality and Corporate Strategy and Structure in Small Firms", Management Science, 32, pp. 1389-1409.

MILLER, A. (1988), "A Taxonomy of Technological Settings, with Related Strategies and Performance Levels", Strategic Management Journal, 9, pp. 239-254.

MINTZBERG, H. (1988), "Strategy-Making in Three Modes" in J.B. Quinn, H. Mintzberg and R.J. James (eds.), The Strategy Process, Prentice Hall, Englewood Cliffs, New Jersey, pp. 82-89.

MORBEY, G.K. (1988), "R & D: Its Relationship to Company Performance", Journal of Product Innovation Management, 5 (3), pp. 191-200.

MORBEY, G.K. and R.M. REITHNER (1990), "How R & D Affects Sales Growth, Productivity and Profitability", Research-Technology Management, May-June, pp. 11-14.

NRC (National Research Council) (1987), "Computer-Integrated Manufacturing: Barriers and Opportunities", National Productivity Review, Spring, pp. 170-177.

ROTHWELL, R. (1978), "Small and Medium Sized Manufacturing Firms and Technological Innovation", Management Decision, 16 (6), pp. 362-369.

SANDERS, R.L. (1971) "The Commercial Value of Patented Inventions", Idea, 15 (4).

SANTARELLI, E. and A. STERLACCHINI (1990), "Innovation, Formal vs Informal R & D and Firm Size: Some Evidence from Italian Manufacturing Firms", Small Business Economics, 2, pp. 223-228.

SCHROEDER, D.M., C. GOPINATH and S.W. CONGDEN (1989), "New Technology and teh Small Manufacturer: Panacea or Plague?, Journal of Small Business Management, July, pp. 1-10.

SCHROEDER, D.M. (1990), "A Dynamic Perspective on the Impact of Process Innovation Upon Competitive Strategies", Strategic Management Journal, 11, pp. 25-41.

SKINNER, W. (1984), "Operations Technology: Blind Spot in Strategic Management", Interfaces, 14 (1), January-February, pp. 116-125.

SKINNER, W. (1985), Manufacturing: the Formidable Competitive Weapon, John Wiley and Sons, Inc., New York.

STANWORTH, J. et al. (1982), Perspectives on a Decade of Small Business Research, Gower Publishing Company Ltd, London.

UTTERBACK, J.M. (1971), "The Process of Technological Innovation Within the Firm", Academy of Management Journal, 14, pp. 75-88.

WELSH, J.A. and J.F. WHITE (1981), "A Small Business is not a Little Big Business", Harvard Business Review, July-August, 59 (4), pp. 18-32.

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