INNOVATION ORIENTATION AND PERFORMANCE IN INDUSTRIAL MARKETS

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Abstract

The contribution of innovation to corporate survival and growth is an accepted notion in much of management. Typologies of strategic orientations of companies based on innovation have been developed and analyzed. Most of these typologies focus on a single dimension of innovation. This study, using the PIMS database, develops innovative types from multiple dimensions of innovation and examines their performance. Results suggest that these types have different performance levels some of which confirm findings based on other typologies. Major implication in terms of performance is that great care must be taken in accepting innovation's contribution. In particular the type of contribution or outcome needs to be examined carefully.

Introduction

Strategy may be viewed as a consistent pattern of decisions about objectives, and plans for achieving them (Kamm 1987). It therefore describes the direction a firm will follow in its chosen environment and guides the allocation of resources and effort (Day 1984). One main objective of strategy is to enable an organization adapt to its environment (Miles and Snow 1978) and this includes such business-level objectives as the development of specific products and services, entry into new markets and the establishment of major research and development projects (Cohen and Cyert 1973). Innovation is thus a major means of linking these business-level objectives to performance and survival. For this reason considerable importance is attached to understanding the process of innovation, and this is reflected in the wealth of literature on the subject.

There are obviously a variety of ways of looking at innovation. The focus in this study is to consider it in terms of an orientation. Thus, no consideration is given to the role of the individual innovation. Rather, the emphasis is on the innovative posture or orientation of a firm as a form of strategic orientation. Unlike some organization theorists, however, the concern is not with the processes that led to the selection of any particular orientation or its effects on internal structures and processes. The study focuses on the strategic role played by innovation orientation in terms of such issues as resource allocation, functional attributes and performance.

Strategic orientation refers to how an organization uses strategy to adapt to changes and challenges in its environment. The strategy aims at a co-alignment with the environment and has variously been described as strategic choice, strategic thrust, strategic fit and strategic predisposition (Chaffee 1985). This adaptive approach to strategy requires the organization to critically assess its environment and then to match its capabilities to opportunities and risks present in it.

There are a variety of ways by which organizations can adapt to or coalign themselves with their environments. This multiplicity of options has led to the development of generic strategies or strategic archetypes from classifications of how different organizations adapt to their environment. Included in these strategic archetypes are those directly related to organizational innovativeness (Ansoff and Stewart 1967; Freeman 1974; Miles and Snow 1978).

These studies focused on organizational innovativeness as a single variable construct and were based on such factors as timing of market entry, research and development (R & D) expenditures, and rate of change in products and markets. Thus, while each study in its own way contributes to an understanding of the dimensions and importance of innovativeness, there appears to be a lack of consideration of how these different dimensions link together. We cannot, for example, tell how rate of new product introduction, timing of market entry and research and development (R & D) expenditures, when taken together, relate to strategy and performance. Consequently, we do not get a very full picture of the links between innovative orientation, strategy and performance.

This study then aims at identifying different types of innovation orientation and the performance levels associated with them, but with a multivariable conception of innovation. The purposes of the study then are to:

(1) develop a typology of innovation orientation using multiple variables relating to innovativeness; and
(2) compare the performance levels associated with each of the types.

Conceptual Background

One approach to examining the relationship between strategy and performance suggests that assessments of a firm's performance are a function of differences in market conditions and the particular strategy employed (Lenz, 1981). This approach can be linked to the viewpoint of Miller and Friesen (1983) who proposed the existence of certain forms of alignment between attributes of an environment and strategy-making behavior to ensure effective selection of strategies. The framework for this study follows these lines of reasoning and implies that different innovation orientations are different forms of adaptation and are associated with different performance levels. In other words the strategies cannot be equally effective as suggested by Miles and Snow (1978).

Innovation Orientation

The importance of innovation has been indicated by numerous authors (Cooper 1984; Kamm, 1987). An aspect of this importance that is of interest for this study is the strategic role of innovation. In considering this role innovation should be considered in terms of an outlook, posture or orientation of a firm that guides its strategies and resource allocation. This is the notion of innovation orientation.

The concept of innovation orientation has been operationalized in a number of ways. Ansoff and Stewart (1967) for example, developed a typology of strategies based on the timing of entry of a technologically intensive firm into an emerging industry. Freeman (1974) focused on the strategic options available for firms faced with changes in their technological environments and classified them on the basis of innovative efforts and their focus, primarily in terms of R&D expenditures. Miles and Snow (1978) based their notion of innovation orientation on the rate at which organizations changed their products and markets in response to changes in the environment.

These studies identified innovation orientation using single variables such as timing of market entry, rate of new product introductions, or R&D expenditures. Such operationalizations do not fully take into account the possible interactions between different aspects of innovativeness and also do not consider the broad scope of what constitutes innovativeness. This scope relates to products, markets, processes, technology and market entry, as well as the effort behind them. In order to understand better the implications of innovation orientation it is important to include as many of these dimensions as possible.

Thus, the concept of innovation orientation used in this study has three main components:

1. New product introductions in both relative and absolute terms.
2. R & D expenditures (product and process).
3. Order of market entry.

Methodology

Database

The data which provide a basis for analyzing issues dealing with the above objectives come from the Profit Impact of Market Strategy (PIMS) database. Information on the environments, competitive characteristics, strategies and performance of a number of business is provided through a survey undertaken annually by the Strategic Planning Institute. A number of limitations of the database have been noted such as its cross-sectional nature, the lack of goal structures which would emphasize intended strategy, the unrepresentative nature of businesses and problems with the measurement of some variables (Anderson and Paine 1978). Despite these limitations, however, studies based on the database have been considered as having substantive relevance and merit (Phillips, Chang and Buzzell 1983; Ramunajam and Venkatraman 1984).

A number of variables describing innovation orientation and performance were selected for analysis. Selection was based on a review of literature relating to aspects of innovation orientation and performance.

Data Analysis

Data analysis was conducted in two phases, with each related to one of the research objectives. Phase 1 dealt with the issue of developing a typology of innovation orientation. Phase 2 dealt with a comparison of the performance levels associated with the types generated in Phase 1.

Phase 1

The approach to developing innovative types was through the use of cluster analysis with the derived clusters serving as a basis for the identification of the types. A cluster program from the Analysis of Quantitative Data (AQD) package provided by the Strategic Planning Institute was used. The program involves a hierarchical algorithm using the minimum squared error approach and is based on squared Euclidean measures of similarity. The Euclidean measure of proximity is not a critical issue for a hierarchical algorithm, which is sensitive to the presence of outliers, if data is standardized before the clustering routine

(Punj and Stewart 1983). This procedure is followed and it also gives the additional benefit of making comparisons easier since all variables are indicated in the same unit of measurement. The minimum squared method chosen is indicated as producing better results when Euclidean proximity measures are used (Punj and Stewart 1983) and is also better for forming homogeneous groups (Schlaifer 1974).

This clustering procedure was applied to a random sample of 350 industrial businesses drawn from the PIMS database. The clustering was based on the dimensions of innovation orientation discussed earlier, i.e., order of market entry, percent new product introductions, relative percent new product introductions, product R & D expenses, and process R & D expenses.

Two criteria were used to select the appropriate number of clusters for further analysis:

1. The interpretability and practicality of the derived clusters in terms of concepts of innovativeness discussed earlier.
2. The drop in the overall root-mean-square prediction error at different merger levels as shown by a dendrogram of the cluster process.

These criteria have been used in similar research (Galbraith and Schendel 1983; Douglas and Rhee 1989; Miller 1988). The resulting clusters are shown in Table 1.

Phase 2

The second phase of the data analysis examined the performance levels associated with the innovative types developed in the first phase. The statistical approached used in this second phase is ANOVA with cluster membership as the independent variable and the functional

TABLE 1

RESULTS OF CLUSTER ANALYSIS: INNOVATION PROFILES OF INNOVATION ORIENTATION TYPES (STANDARDIZED MEANS)

CLUSTER VARIABLE	PRODUCT INNOVATORS (# 30)	PROCESS INNOVATORS (# 49)	LATE ENTRANT NON-INNOVATORS (#136)	ORIGINAL PIONEERS (# 135)
ORDER OF MARKET ENTRY	-0.139	0.472	-0.966	0.832
RELATIVE % NEW PRODUCTS	2.561	-0.285	-0.164	-0.300
PERCENT NEW PRODUCTS	2.002	0.855	-0.414	-0.338
PRODUCT R & D	0.941	0.882	-0.446	-0.080
PROCESS R & D	0.275	1.561	-0.264	-0.362

TABLE 2
PERFORMANCE LEVELS OF THE INNOVATION ORIENTATION TYPES
(Standardized Mean Scores)

PERFORMANCE	PRODUCT INNOVATORS (#30)	PROCESS INNOVATORS (#49)	LATE ENTRANT NON-INNOVATORS (#136)	ORIGINAL PIONEERS (#135)
Return on Investment	-0.3758*	-0.1159	-0.0255	0.1513*
Cash Flow on Investment	-0.6985***	-0.2429*	0.0119	0.2313***
Cash Flow From Operations	-0.7211***	-0.3992***	0.06323	0.2415***
Market Share	0.0009	-0.1152	-0.1968**	0.1566**
Relative Market Share	0.0643	0.1088	-0.2276***	0.1756**
Market Share Growth	1.0179***	-0.1151	-0.0358	-0.1484*

$p < 0.5$; **$p < 0.01$; ***$p < 0.001$

attributes and performance level variables as dependent. A comparison of a cluster with the overall mean of the sample on a particular dependent variable gives an indication of how the particular cluster differs. The results of this phase of the analysis are shown in Table 2.

Results and Discussion

It should be borne in mind when following the discussion and also in reading the figures in the tables that the numbers represent the mean scores of the different cluster groups relative to the average for the sample as a whole. Cluster comparisons are therefore made in terms of their relative differences from that average. A negative score indicates that a particular cluster is below the average while a positive score shows that it is above the average for all businesses in the sample. With respect to the order of market entry variable though a negative score indicates relative late entry while a positive score describes relatively early entry.

Innovative profiles of clusters

Cluster 1: Product Innovators
This group is characterized by the highest rates of new product introductions in both absolute and relative to competitors terms. Expenditures for product R & D are also highest while those for process R & D are moderately high, second only to the second cluster. This group of businesses entered their markets relatively late. Based on these characteristics they are labelled Product Innovators and constitute about 9% of the sample.

Cluster 2: Process Innovators
Characterized primarily by the highest expenditures on process R & D this group also has moderately high expenditures for product R & D, second only to the Product Innovators. They also have moderately high rates of new product introductions, again second only to Product Innovators. In relative terms, however, they score quite low, only slightly better than the fourth group which is the lowest. This group also entered its markets relatively early. On the basis of these characteristics this group is described as Process Innovators. They comprise 14% of the sample.

Cluster 3: Late Entrant Non-Innovators
This is probably the least innovative group. They entered their markets relatively later then the other groups and have quite low rates of new product introductions as well as low expenditures on both types of R & D. Comprising about 39% of the sample these businesses are described as Late Entrant Non-Innovators

Cluster 4: Original Pioneers
Having pioneered in their markets these businesses are quite non-innovative especially with respect to new product introductions and process R & D. They do, however, have a relatively smaller difference from the more innovative groups in terms of product R & D expenditures. This may suggest some concern with product modifications. Constituting about 38% of the sample this group is labelled Pioneers.

The innovative profiles of the groups suggest similarities to types identified by other researchers. Product Innovators

may be considered a type of the Prospectors of Miles and Snow (1978) in that they change products at a very high rate. Their high rates of product R & D also suggest a similarity to the Offensive type of Freeman (1974). Given their relatively low scores on market entry variable these businesses may be described as Late Entrants of the Ansoff and Stewart (1967) type which are now in the innovative mode.

The Process Innovators are akin to the Defenders of Miles and Snow (1978) and Imitators of Freeman (1974). Their high expenditures on process R & D indicate an emphasis on achieving greater efficiency in production processes and engineering in general. Their relatively early entry into their markets, coupled with relatively high product R & D expenditures also suggest an Imitator strategy, as well as being the Early Follower of Ansoff and Stewart (1967).

Late Entrant Non-Innovators may be compared to the Reactors of Miles and Snow (1978), Dependents of Freeman (1974) and Me-Toos of Ansoff and Stewart (1967). The basic characteristic of these types is their extreme non-innovativeness as evidenced by low R & D expenditures, low rates of new product introductions, and lack of a pioneering attitude.

Original Pioneers, as identified in this study, are characterized primarily by having been the leaders or among the leaders in first developing a type of product in their markets. They are probable most closely related to the Applications Engineering type of Arnsoff and Stewart (1967) and the Traditionalist of Freeman (1974). These types have little or moderate product R & D expenditures probably aimed at product modifications to maintain position in existing markets, given their low rates of new product introductions.

Performance levels of the innovative types

Product Innovators experience very poor financial performance, a finding similar to that of Hambrick (1983) for Prospectors. Such a finding is not surprising given the high costs associated with the strategy. Yet new products and innovation in general are considered or accepted as crucial to the survival of companies. One rationalization for this apparent inconsistency may be that it is a temporary strategy designed to gain entry into a market. This is plausible because the businesses are primarily late entrants into established mature market situations. The other significant performance attribute of this group is the very high rate of market share growth and again this is consistent with Hambrick (1983). For this strategy then attempts to gain market share are successful but result in negative impacts on cash flow and ROI. These latter effects suggest that the strategy cannot be pursued for long periods of time.

Process Innovators also exhibit poor financial performance, especially in terms of cash flow although they are somewhat better than the Product Innovators. Previous research (Freeman 1974; Miles and Snow 1978) indicated that such efficiency-oriented strategies led to good performance but the assumption there would be that the efficiency objective was achieved. The performance of this group reinforces the discussion on Product Innovators that a strategy of extreme innovativeness is a drain on cash flow and profitability. Businesses in this group are not even rewarded by market share gains.

Significant attributes of Late Entrant Non-Innovators are very low levels of market share in both absolute and relative to leading competitors terms. Obviously this kind of low end budget strategy is not designed to gain a strong market share position. Like the Dependents of Freeman (1974) and Reactors of Miles and Snow (1978) these businesses appear to accept their subordinate positions. While not statistically significant they do not appear to fare as badly on the measures of financial performance.

The Original Pioneer group has superior performance on all measures except market share growth for which it has the lowest score. Their superior marketing performance supports previous research by Robinson (1988), Robinson and Fornell (1985), and Urban et al. (1986) which indicated the superior market share associated with pioneering in a market. Such pioneering leads to superior performance because of cost advantages, experience, and serving the more attractive markets first (Kotler 1980; Robinson and Fornell 1985; Spence 1981).

Conclusion

Through the process of cluster analysis a taxonomy of innovative types was developed which provided a basis for assessing differences in the performance levels of businesses with varying innovation orientations. The taxonomy clearly indicates that different groups of businesses focus on different dimensions of innovativeness and this leads to differences in performance. Evidence from this study indicates that innovation may not be all that it is made out to be. In the case of extreme product and process innovativeness the impact on performance does not appear to beneficial, at least in the short term. A logical extension of this study then would be a more careful analysis of the rationale behind the traditional acceptance of innovation's contribution to the survival and growth of firms. Specifically, researchers need to focus

more on the environmental contingencies and time frames associated with traditional assumptions.

A striking finding is the poor performance of Process Innovators. It could be argued that this is a situation where intentions (i.e., process R & D expenditures) do not match outcomes (i.e., production efficiency). This is an area where the criticism of the PIMS database as lacking indicators of intended strategies and goal structures may be pertinent. In essence there may be gaps between intended outcomes and actual outcomes. One could also argue, though, that efficiency effects of process innovativeness do not show up in the short term or over the four year period that the data is averaged for.

The multidimensional nature of innovation used in this study probably makes analysis more difficult. This, though, is a more realistic picture of what goes into innovation. For example, extreme product innovativeness is likely to go hand in hand with high levels of product and process R & D. If the effort that goes into the product innovativeness, that is, R & D is ignored, then the true cost of that innovative orientation would have been underestimated. A contribution then of this study then is how it takes into account three important dimensions of innovativeness, output, input and timing to give a fuller picture of its implications. Such a consideration of the major dimensions of innovativeness is necessary for a better perspective on its implications for businesses.

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