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**Internal corporate venturing: An exploratory study integrating technology  
and strategy**

**David, Byron Lambros, Ph.D.**

**City University of New York, 1990**

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A

Internal Corporate Venturing: An  
Exploratory Study Integrating  
Technology and Strategy

by

Byron L. David

A dissertation submitted to the Graduate Faculty in  
Business in partial fulfillment of the requirements  
for the degree of Doctor of Philosophy, The City  
University of New York.

1990

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## Abstract

Internal Corporate Venturing: An  
Exploratory Study Integrating  
Technology and Strategy

by

Byron L. David

Advisor: Professor Michael N. Chanin

This dissertation contrasts the product innovations generated by internal venture groups found in Fortune 500 high-technology companies with those of the firms' mainstream divisions, as well as with those of independent small firms. A number of associations between these groups on the basis of the product attributes and the diversification represented by the innovations are explored. The attributes include success, radicalness, and performance; and, two types of diversification are defined — marketing and technological. The dynamics of the environment are also considered. For example, in a given environment, internal venture products were found to be highly distinguishable from those of mainstream divisions and small firms on the basis of product radicalness and marketing diversification. Additionally, the study looks closely at the organizational characteristics of the internal venture groups

through factors defining organizational differentiation and integration; and, at the origin of product concepts. Here, the presence of intrapreneurs and their relationship to different types of venture managers is examined on the basis of product concept origin, product attributes, and the degree of diversification represented by the product. This research was achieved by conducting a large-scale survey that included structured telephone interviews, followed by a mail questionnaire developed specifically for this purpose. The sample was comprised of U.S. firms in the electronics, computer, chemicals, and scientific and photographic equipment industries. Advanced multivariate statistical methods using SPSS/PC+ V2.0 were employed to analyse the data. The results of this study should be of particular interest to corporate planners and policymakers. Recommendations for future research are included.

\* \* \* \* \*

To my wife Sandra,  
whose love made this possible.

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small businesses — all of whom made very useful observations. Encouraging comments and helpful suggestions were also received during five presentations to the faculty and students at the Management Planning Systems Doctoral Seminars during the 1988/89 academic year at Baruch College. I was indeed very fortunate to have had such diverse support, and am very grateful.

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\* \* \* \*

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## CHAPTER 1

## INTRODUCTION

General

Internal Corporate Venturing (ICV) Strategies are intended to help very large firms become more product-innovative. By creating new business units within the firm designed to reproduce what are believed to be some of the key conditions found in small (entrepreneurial) firms, large firms hope — through the retention and cultivation of key employees — to generate products that will help to ensure their diversification and growth.\*

In his keynote address to the Academy of Management's Technology and Innovation Management Division at the Academy's 1989 Washington D.C. conference, Prof. Ed Roberts of MIT noted that "there is no research on the integration of technological considerations with strategy". This dissertation addresses an aspect of this research need by answering the following question: What can we expect from internal venture strategies in terms of technological innovation\*\* and organizational change — or more

\* Regarding the notion of employee retention and cultivation in this context, see, for example, Vesper and Holmdahl [1973], and Roberts and Berry [1985]; and with respect to the value of diversification, see Rumelt [1982], among many others.

\*\* By technology we mean that which is inherent in the product, as well as those processes making its development and delivery possible.

specifically, what is the association between product attributes such as, success, radicalness, and performance with various organizational and environmental characteristics?

### Objective

This research explores the attributes of the product innovations arising from new business venture units within very large (Fortune 500) high-technology\* firms; and describes some of the organizational dynamics associated with these units. For added depth — i.e., because our question is best answered within a context — these innovations are contrasted with those generated by the large firms' mainstream divisions, as well as with those of small independent high-technology firms. Strategic relationships between product and organizational variables have been found. A number of "innovation-organization fit" (a priori) hypotheses are tested; and, additional (exploratory) tests of the variables provide the basis for the development of recommendations for future research.

\* "High-technology firms" is defined in the section on Sample Characteristics

### Background

The literature dealing with ICV has focused mainly on the planning and evaluation of ventures, and on determinants of success and failure (see for example, Burgelman & Maidique [1988]; MacMillan & George [1985]; Block [1982]); and on rates and measures of success [see for example, von Hippel, 1978, and Biggadike, 1979]; without giving much attention to the product innovations being generated by the venture groups. This literature has been either case-oriented, involving anywhere from one to twenty firms; or surveys asking executives to list the most relevant factors for ICV success and failure. These efforts have resulted in the bases for many hypotheses.

Regarding an aspect of ICV known as intrapreneurship, the literature does not at all appear to address the relationship of intrapreneur and venture manager. Hisrich & Peters [1986] very briefly mention intrapreneurship and ICV as synonymous concepts, perhaps implying that intrapreneurs and venture managers are also synonymous. We have attempted to shed some light on the roles of intrapreneurs and venture managers, and to assess their impact on the venture organization.

The research dealing in some detail with innovation types and/or rate has taken a number of perspectives, but has not been

tied to the ICV literature. There has been some research on "radicalness of product innovation" vs. "firm size" (see for example, Ettlie & Rubenstein [1987]; Krasner & Dubrow [1979]), as well as research dealing with the "rate of product innovation" vs. "firm size" (see for example, Edwards & Gordon [1984], Gellman Research Associates [1982], Rothwell [1978], and Foxall [1984], who provides critical analyses of early research, including the SAPPHO and NewProd projects). It is also substantially related to the areas of economics and marketing (see the surveys of Freeman, [1982]; Foxall, [1982]; and Cooper, [1983]), and does not deal with organizational characteristics other than size. Though, as we shall see, this product-related literature has not produced consistent findings, it is a valuable source of terminology and concepts.

The literature review in chapter 2 is intended to cover the areas that have directly influenced the formulation of this research, and which are most relevant to its findings.

### Methodology — A Brief Overview

The unit of analysis is the organization — with each organization's most recently commercialized product serving as a focal point. Structured telephone interviews followed up with mailed questionnaires and post-response interviews were used

to collect the data. Advanced multivariate statistical techniques, such as factor analysis and discriminant analysis, are used, respectively, to determine the identity and relationships of factors. Figure 1 provides a simplified illustration of the research process.

Since this research deals with a unique set of questions, it was necessary to design a questionnaire to fit our specific needs. Hence it was essential to ascertain the questionnaire's reliability, and to find significant correspondences between the derived constructs and the literature — i.e., to validate the questionnaire. Needless to say, the design of the questionnaire and the survey method account for a major portion of this dissertation effort. Chapter 3 goes into detail on the constructs' derivations based on the literature, and chapter 5 illustrates the statistical analyses that lead us to the final construct definitions. The survey and data analysis methodologies are discussed in chapter 4.

### Contributions

The contributions of this research are quite varied. Specifically, this study:

1. Develops a definition of ICV based on the literature.\*

\* In a comprehensive literature review, MacMillan [1985] identified the definition of ICV's scope as one of many areas that needed attention by researchers.

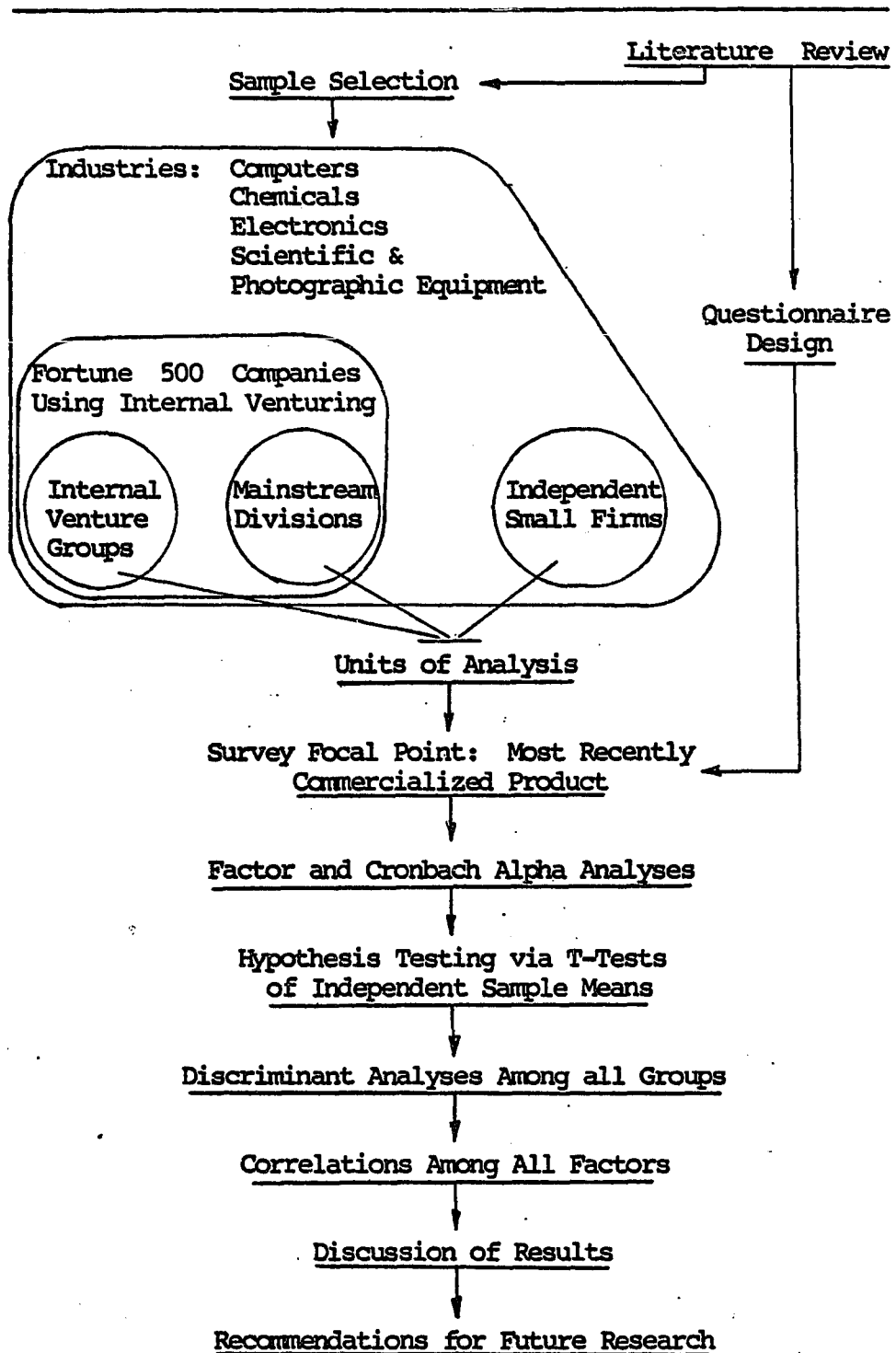


FIGURE 1 — An Overview of the Research Process

2. Constructs and uses a questionnaire based on terminology and concepts drawn from several streams of literature.
3. Develops and uses a custom survey method.
4. Uses the product innovation as the focal point for the research.
5. Distinguishes concepts of product radicalness (which is defined with respect to the marketplace) and marketing and technological diversification represented by the product innovations.
6. Confirms some of the findings in the ICV literature -- which has been strictly case study based -- using a large scale cross-sectional study.
7. Differentiates the roles of venture manager and intrapreneur; and identifies the sources of product concepts -- which are not identified in the non-intrapreneurship ICV literature.
8. Relates ICV to mainstream divisions (MDIV) and established independent small firms (SF) on the basis of product, organizational, and environmental characteristics. Discriminant analysis is used to identify the attributes most characterizing and differentiating the three groups.
9. Tests a number of hypotheses implied by the literature.
10. Produces findings which integrate technological innovation and strategy.
11. Makes specific suggestions for future research.

#### The Study's Limitations

1. Since only four industries are covered by the survey, the results may not apply to all industries.

2. The small firms surveyed were independent and well established — i.e., they operated strictly on internal funding or bank loans, and were not start-ups. Hence the results probably do not apply to many other classes of small firms, such as those which are backed by venture capital.
3. The data are based almost entirely on the perceptions of the top managers who were interviewed and then sent a questionnaire — i.e., very little objective data was obtained, such as financial.
4. Though a number of elements in the survey and data analysis are believed to have substantially ensured questionnaire reliability, one could argue that the lack of multiple respondents for each case reduces the reliability of the data.

#### Concluding Remarks

In addition to frequent communications with colleagues at various institutions, the working papers at Babson College, NYU, the First Boston Working Paper Series published by Columbia's Graduate School of Business, and the abstracts appearing on ABI/Inform's CD-ROM, among other places, were consulted on a continuing basis to keep this researcher abreast of the latest developments in the ICV and product innovation areas. Also, by special invitation, a proposal for this research was presented at the Academy of Management's (first) Doctoral Consortium on Technology and Innovation Management (in Washington D.C., 1989).

The results of this research should be of particular interest to corporate strategists including, corporate planners,

venture sponsors, and venture managers, among others, who are in a position to formulate and implement ICV strategies. They should also be important to government policymakers who are concerned with the relevance of particular classes of product innovations to the long-term health of the US economy, and may be able to more effectively apportion incentives to the private sector on that basis.

\* \* \* \* \*

## CHAPTER 2

## LITERATURE REVIEW

General

It is necessary to consider a number of streams of literature, namely in management, marketing, and economics, in order to justify this research effort, and to support its methodology and findings. We are basically seeking to relate strategy, organizational dynamics and structure, and product attributes.

A great deal has been written about strategy, and in the area of diversification we find such notable researchers as Rumelt [1982]; and as it relates to internal venturing, Roberts [1980], Yip [1982], and Kazanjian and Drazin [1987], among others. Organizational structures suitable to various amounts of environmental and task uncertainty have been analyzed by Lawrence and Lorsch [1969] and Galbraith [1977], among others; and most recently taxonomized by Mintzberg [1979]. In the area of "strategy and structure" we have the seminal work of Chandler [1962] with the subsequent refinements of Galbraith and Nathanson [1980], and Scherer [1984], among others.

Product attributes are discussed very generally in the

management literature dealing with diversification, using such simple descriptors as "new product/existing product", "new market/existing market", etc. — in the literature on ICV, see for example MacMillan and George [1985]. They are also discussed, but in more detail, in the marketing and economics literature with such descriptors as "radical" and "incremental" — see for example Krasner and Dubrow [1979] — where, for the most part, the focus is on the quantity of contributions of various size firms in various industries.

The literature reviewed here, as well as other sources, will be appropriately invoked throughout this research.

### The Literature on Internal Corporate Venturing

#### Identifying ICV and Venture Groups

Roberts [1980] provides us with a broad and useful framework within which to view ICV. He presents a spectrum of six new venture strategies on a continuum according to the corporate involvement that each one requires. So, for example, "venture capital" requires low corporate involvement and is at the far left of the spectrum; "venture spin-off" and "joint venturing" require relatively more involvement, and are

approximately in the middle; and ICV, which requires the highest degree of corporate involvement, is to the extreme right [Roberts, 1980:136] — see figure 1. By corporate involvement Roberts refers to financial and management support. Strongly

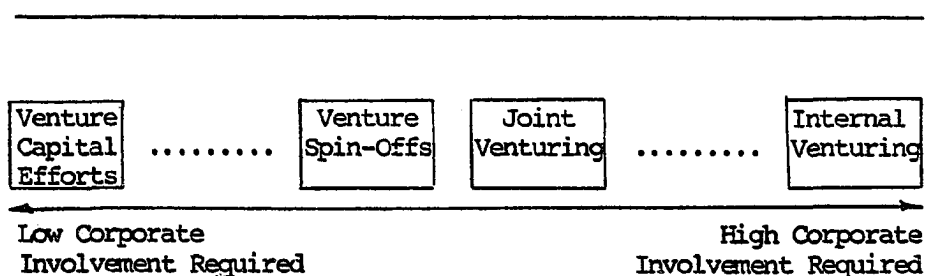


FIGURE 1 — Spectrum of New Venture Strategies  
[adopted with modifications from Roberts, 1980:136]

---

implied is that this support is significant in terms of its magnitude and the degree to which it is realtime. Roberts also provides us with a definition of ICV, albeit a very broad one, seeing it as "... situations in which a company sets up a separate entity within itself — an entirely separate division or group — for the purpose of entering different markets or developing radically different products" [1980:136].

In an in-depth study of ICV, Hill and Hlavacek [1972] characterized their 100 venture groups as: being autonomous with

respect to the firm's operating divisions; being multidisciplinary; having diffuse authority structures; having broad missions; having direct access to senior management; and being given flexibility with respect to deadlines. Vesper [1984] found autonomy to be one of the prevalent characteristics among the 77 venture groups he studied.

The general acknowledgement over many years of von Hippel's [1977] empirical analysis of "Successful and Failing Internal Corporate Ventures" suggests that his definition of ICV is widely accepted:

An internal corporate venture ... is an individual or group within the corporation which has taken on responsibility for all aspects of the task of: developing a new product; bringing it to market; carrying it through at least its initial phases of marketplace activity [p. 163]

Moreover, von Hippel [1977] found that responsibility for these "tasks" rested with the venture manager — a characteristic, as he noted, that differentiated ICV from "... other organizational strategems aimed at the same goal of new product development" [p. 163].

Fast's [1978] landmark longitudinal study looked at the evolution of what he called "new venture divisions" (NVDs). He found that internal venturing's NVDs could be described on the

basis of their corporate-prescribed missions and objectives. These went from narrow to broad for "micro" versus "macro-NVDs" respectively. The micros tended to stay close to the mainstream, and be a sort of clearing house for product concepts that could arise anywhere within the firm; whereas, the macros were expected to lead the corporation into businesses that were relatively unrelated to the mainstream business.

Burgelman [1983] explored the autonomous nature of a major corporation's NVD, and the interface problems and solutions that emerged while it was carrying on six major projects. The NVD had a "business management" and an "R&D management". Burgelman developed a useful framework for visualizing the interactions of the corporate, NVD, and venture managements with respect to the "core" and "overlying" processes at each level.

Recently, Hisrich and Peters [1986] investigated the structures and performance of "new business venture units" within large firms. They also reported on the designations — thirteen in all — used for these units — for example, "corporate development", "new product", "new business venture", and "market development" divisions, among others. Most recently Bart [1988] has referred to them as "new venture units"; and many researchers

simply use the general designation of "internal development" — see for example, Yip [1982], and Burgelman and Sayles [1986]. Hisrich and Peters [1986] also reported on the functional areas present in their sample of 168 new business venture units. The most frequently mentioned were marketing, finance, and R&D, in that order; however, they do not report on the extent to which these units included multiple functional areas.

In a less direct manner, MacMillan and George [1985] suggested defining ICV according to the degree to which the venture's product and/or market are departures for the firm. For example, "Level 1" ventures are simply defined as enhancements to products or services, and at the other end of the spectrum, "level 6" ventures pertain to entirely new products or services for new markets [pp. 34-35]. Also, in the same article, MacMillan and George [1985] indirectly define ICV on the basis of the existence of a "venture manager" and "venture ombudsman"; as well as a "senior manager" who has the authority to support a venture program taking longer than two years. The venture manager is the individual "...directly responsible for moving the business idea from concept to full commercialization", and the venture ombudsman "...is a representative of senior management who interfaces directly with the venture managers ... and can have a formal title and direct responsibility for the venture

process, or he can perform the function on an ad hoc basis" [p. 35]. These roles are consistent with those revealed by von Hippel's [1977] study, and by Burgelman and Sayles [1986]. In some instances the term venture "sponsor" is used to describe what is clearly the role of venture ombudsman, as described above.

### The Roles of Intrapreneurship

Intrapreneurs have been viewed from basically two perspectives: those who perform in an entrepreneurial manner to generate administrative or process innovations for the firm (see Nielsen et al., 1985; Sussman & Kuzmits, 1986; de Chambeau & MacKenzie, 1986; and Doescher, 1985; among others); and those who champion the development of new products, from idea generation to full commercialization (see for example, Pinchot, 1985 & 1987; and Duerr, 1986; among many others). Since we are concerned with product innovation, we shall be alluding to the latter concept of intrapreneurship

Pinchot, who is widely acknowledged as the originator of the term "intrapreneur", proclaims that what is special about intrapreneurship is the identification of a "... zealous volunteer champion" [1987:7] who will quickly bring an innovation

to the marketplace; and identifies such champions as Iaccoca of Ford, Estridge of IBM, Fry of 3-M, and others. He claims that if technical people with a high need for achievement exist, that the firm need only create the appropriate environment, and intrapreneurs will emerge. Johnston [1989] of the 3-M Corporation provides us with the following look inside:

3-M has a "15% rule" for all technical employees. Technical employees are allowed up to 15% of their time to work on any programs or ideas of their choosing. This working principle is not rigidly enforced, nor does it have to be. The rule legitimizes the far out R&D activity that may lead to significant new business. A supervisor or manager cannot stop someone from working on a specific program at 3-M. The 15% rule preserves the individual's right to pursue his or her ideas. People are urged to try new things [1989:20].

In other words, an intrapreneur is someone who conceives a product — pretty much on their own — and develops it to the point where it might draw support from other individuals and departments in the mainstream organization, or from an existing venture group [David and Chanin, 1989].\*

Finally, Hisrich and Peters [1986] are perhaps the only researchers who have considered the role of the "intrapreneur"\*

\* While there is a great deal of trade, and some journal, literature on intrapreneurs, Pinchot [1987] is generally credited with having popularized intrapreneurship — in particular the form which is oriented toward markets outside the firm. For a more complete review of the literature, and an assessment on how intrapreneurship is related to ICV in general, see David and Chanin [1989].

in conjunction with ICV. They appear to consider intrapreneurship and internal corporate venturing as synonymous. David and Chanin [1989], however, do not see them as so, but rather find that the literature mostly suggests that venture managers and intrapreneurs have different orientations and roles. They also concluded — based on the bulk of a vast body of literature with diverse perspectives — that the intrapreneur is someone who emerges spontaneously, ideally under a favorable corporate environment; whereas, the venture manager and his/her organization are part of a preconceived corporate process.

\* \* \* \*

While ICV has had many labels, there appears to be some consensus on the scope of its activities and the main players' roles. Generally, if we follow the premise that an ICV product innovation must be either technologically new to the firm, or new from the standpoint of markets served by the firm, or both (see for example, Roberts and Berry [1985]), then we could fairly make the assumption that the internal venture group includes either its own R&D function, or marketing function, or both — a notion that is consistent with the definitions of ICV cited above.

Also, it appears that we can further identify these groups through the existence of venture managers and venture ombudsman — or their equivalents — and a "venture" group whose mission is distinctly different than that of the mainstream organization's product development group — i.e., it amounts to getting the firm into a new business. Finally, we can probably say that venture groups are relatively autonomous within the firm. What had not been substantially determined, and is addressed further on in this study, is how intrapreneurs relate to venture managers — though they have both been referred to as "champions"\*.

Figure 2 is proposed to clarify what amounts to a range of internal venture strategies presented in the foregoing discussion of the literature. Viewing internal venturing strategies on the

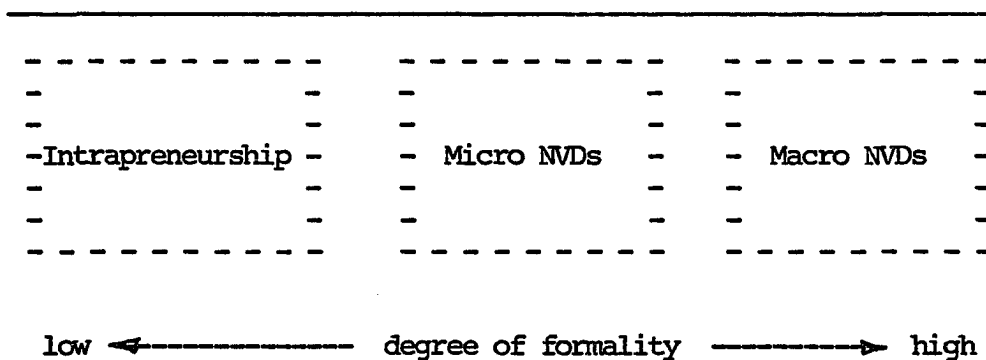


FIGURE 2 — The Relative Formality of Internal Venture Strategies

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basis of relative formalization, we can use the much alluded to (see for example, Burgelman & Sayles, 1986) case of Fast's [1979] "Macro NVD" as the example of the most formalized approach. Here there is an a priori definition of the group's mission and product objectives, and a preselection of the venture manager. This occurs to a much lesser degree in the case of "Micro NVD"; and in the case of intrapreneurship, we have the establishment of a "corporate umbrella" within which an intrapreneur might spontaneously emerge.

#### Evaluating ICV

It appears that the bulk of the literature on internal venturing deals with the effectiveness of the strategy, and invariably draws conclusions on what may have gone wrong and what may be done to overcome difficulties in the future. For example, based on graduate (MBA) student interviews of major firms -- Block [1982] identified major decision areas that must be dealt with when attempting to start a new venture. Based on

\* "Entrepreneuring or Championing" within a firm involves "... recognizing, proposing, pushing, and demonstrating a new (his or her own or someone else's) technical idea, approach or procedure for formal management approval" [Roberts & Fusfeld, 1982]. This definition is widely accepted, and the term champion has been applied to intrapreneurs as well as to venture managers.

structured interviews, George and MacMillan [1985] concluded that it is advisable to have a creation (venture) manager who will initiate the venture and help it achieve a critical mass, and then to employ a successor — a momentum (venture) manager — who will carry it through to the commercialization stage. Within these two stages are detailed guidelines on how to deal with their particular major challenges. Additional guidelines for success in ICV are offered by Block [1985], Klavans et al. [1985], Calish [1984], Roberts and Berry [1985], Sweeting [1981], and Hill and Hlavacek [1972], among others.

In what has been recognized as a classic case study, Burgelman [1985] looks at the boundary-spanning issues presented by new venture divisions, and what he calls the "interlocking activities". In a later article, Burgelman [1985] discusses the mixed successes of NVDs, appearing to corroborate Quinn's [1979] earlier findings on, such points as, managerial control. Both researchers have essentially identified issues of organizational differentiation (differences in orientation and in the formality of structure) and integration (the degree of collaboration between departments), as defined by Lawrence and Lorsch [1969], as basic to ICV performance.

In a case study of 37 internal ventures at Exxon, Sykes [1986] revealed that their financial success was inversely

related to the associated levels of market and technical risk at the outset of the ventures.

It appears that we have a body of literature that identifies many factors as being critical to the success of ICV. Rather than summarize these here, we shall appropriately refer to them as we proceed.

### Measures of Success and Failure

There are two prominent studies that have roughly assessed the success of ICV — von Hippel's [1977] and Biggadike's [1979]. In a financial study (his criteria for success and failure were not explicit) of 18 ventures among 7 firms, von Hippel found that those which had succeeded had venture teams that were familiar with their markets. He also noted that "there is no initially apparent reason why internal corporate venturing should be successful only within a certain market, product or technology area, or within a certain size range" [1977:166]. Biggadike, who conducted a financial study centered on ROI, found that those ventures which had succeeded began with large-scale and long-term corporate commitments, and a product which apparently helped balance the firm's product portfolio. It should be noted that Biggadike's study included various types of ventures.

What the literature does not tell us, however, is what it takes to finally achieve a successful venture. In other words, how many had to be tried before one was allowed to follow through to commercialization? As Maidique and Zirger [1984] suggest, a venture may be deemed successful if it has in some ways paved the way for future successful ventures. Also, the relative importance of cashflow, ROI, and market share have not been dealt with -- leaving the term success with some ambiguity.

On a comparative basis, Weiss [1981] and Fast [1981] looked at the performance of ICV and of independently started new businesses. They used Biggadike's [1979] data for ICV performance, and their own data -- Weiss is president of Business Development Corporation, and Fast is president of Venture Economics, both venture capital businesses -- for the venture capital supported small firms in their studies. The small firms clearly outperformed the ICV organizations in terms of profitability. Also, during the course of his interviews, Weiss observed that "with respect to new ventures, the individually launched business places greater emphasis on ends than on means compared to established firms" [p. 51].

\* \* \* \*

So here we have a number of criteria that can be at least

tentatively used to establish a construct for success. Also, it appears that success is not industry-specific — a finding which has implications for the scope of our sample.

### The Research on Product Innovations

#### Types of Product Innovations

Here we turn to a cross-section of the marketing, engineering management, economics, management, and business strategy research in order to gain some insights into the categorization of products. The reader should bear in mind that we are interested in product innovations — industrial as well as consumer — rather than administrative or operating (process) innovations that an organization might create for its own use.

In a study of success and failure factors of the U. S. electronics industry, Maidique and Zirger [1984] defined product innovation simply as something that is technologically new and has commercial value. This definition was not unlike that used in the SAPHO [Foxall, 1984] study; which the Stanford Research Project described by Maidique and Zirger is designed to replicate. Both of these studies, and Project NewProd [Cooper, 1983], looked at pairs of innovations, one successful and the

other unsuccessful, competing for the same market. The product development capabilities of each innovation's firm were then assessed through an extensive survey. MacMillan and George's [1985] "Level 1" through "Level 6" designations, noted earlier, offer as little precision in identifying the nature of innovations.

Heany [1983] delves directly into defining product innovation, presenting a spectrum of innovations as a function of the product and process technology; the existence of an established market; the existence of a served market; and customer knowledge of the product — see table 1.

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TABLE 1 — The Spectrum of Product Innovation  
[adopted from Heany, 1983:4]

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Does Market Exist?	Is Firm Serving Market?	Is Product Familiar to Customers?	DESIGN with respect to Product	EFFORT Process	Nature of the Product Innovation
yes	yes	yes	minor	nil	style change
yes	yes	yes	minor	minor	product-line extension
yes	yes	yes	significant	minor	product improvement
yes	yes	yes	major	major	new product
yes	no	yes	major	major	start-up bus.
no	no	no	major	major	major innov.

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We will for the most part use Heany's indicators as guidelines for our questionnaire items regarding product radicalness, with one exception. Since we wish to separate product radicalness from the diversification represented by the product innovation, we must attempt to develop the radicalness construct without including an item gauging whether "the business is already serving the market". In other words, radicalness will rest on the newness of the technology to the industry, and the degree to which functional equivalents exist in the marketplace. This notion is consistent with the findings of Gobeli and Brown's [1987] comprehensive literature review.

#### **Product Innovation & Diversification**

The ICV literature, in general, discusses degrees of relatedness regarding new venture products; however, only recently has there been an attempt to operationalize the concept. Burgelman and Sayles [1986] described diversification in terms of "operational linkages" — or how strongly the "entrepreneurial and corporate operations" are coupled. The degree of coupling (or relatedness, or diversification), is defined by them to be a function of the integration of the work flows and personnel, and the flow of information and know-how, including personnel transfers [p. 182]. Kazanjian and Drazin [1987], in a paper on

the implementation of internal diversification strategies, argue that the literature supports the definition of relatedness as a function of the firm's familiarity with the market, process technology, and product technology — see figure 3.

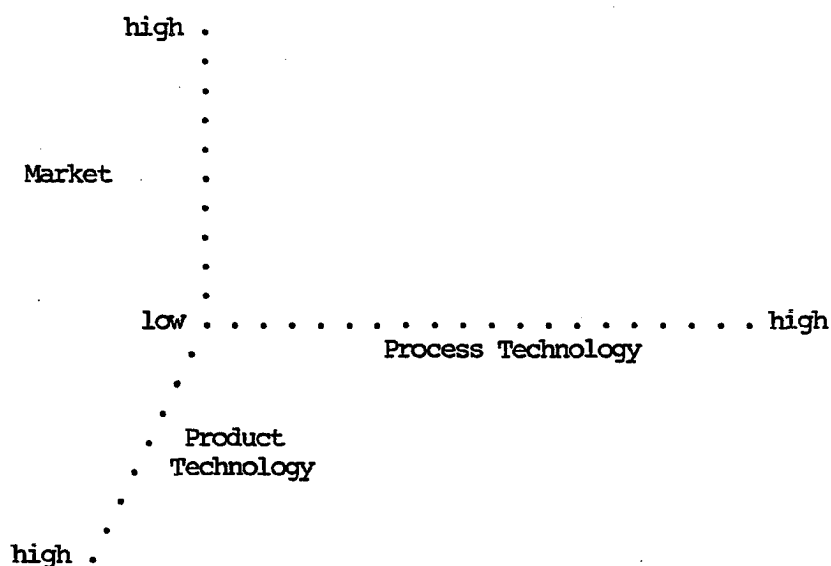


FIGURE 3 — Degree of Relatedness on Three Prime Functional Dimensions — adopted with modifications from Kazanjian and Drazin [1987:348]

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We shall adopt indicators for our questionnaire items based on Burgelman and Sayles' [1986] and Kazanjian and Drazin's [1987] concepts of diversification (or relatedness).

### Firm Size and Product Innovation

The SBA and General Accounting Office (GAO), as well as government agencies in the UK and Canada, among others, have shown a great deal of interest in the contributions of small firms versus large firms in terms of the economics, rates, and significance of innovations. The research appears to be based on either data gathered through mail surveys and/or interviews consisting of anywhere from eight to twenty independent questions, some of them free-form; or, on the use of surrogate measures, such as R&D expenditures, based on existing publications.

Krasner and Dubrow [1979] gathered complete sets of data for 25 firms. Regarding the findings that can be related to this study, on the basis of free-form (or open-ended) questions, they concluded that small firms are more likely to produce "radical" product innovations than large firms; and, that large firms are more likely to produce process innovations and incremental product innovations. These conclusions, however, are based on overall assessments of the firms by the respondents — focusing mostly on patented inventions, R&D activity, the firms' environments, and their strengths and weaknesses — as opposed to commercialized products within a given time-period. Finally, the

fact that these researchers surveyed small firms that were "babies" produced results that are quite intuitive. The notion that large firms are more likely to produce process innovations is additionally borne out by Sullivan's [1983:17] analysis based on comptastat tapes. He suggested that large firms have an advantage over small firms in process innovation due to their more extensive facilities and internal markets.

Using again a direct survey method similar to the one just described, Gellman Research Associates [1982] looked at technological innovation versus firm size. Here, however, the final innovation sample size was quite large (245) and the questions focused mainly on the quantity of commercialized products within a given time period, their source of funding, and the average cost and time it took to develop these to the point of full commercialization. Their data analysis is based on innovations over a 12 year time period in 63 industries; however, it is not clear how many firms responded [see Gellman Research Associates, 1982:27].

The Futures Group [Edwards and Gordon, 1984] basically repeated the Gellman study with a significantly larger initial innovation sample size, and a measure of innovation "significance". They finally "interviewed" 375 firms in 362 industries, however, once again, the distribution of innovations

over the firms is not clear. Both studies first identified their innovations through trade and other publications, and then identified the firms. Small firms were those with fewer than 500 employees. A comparison of the findings from the two studies — to which we will be referring from time to time — is provided by Edwards and Gordon [1984:3-5]. It should be noted that Edwards and Gordon's definition of "significance" is based on a single question, which basically asks the respondent to rate, on a scale of 1 to 4, the product's newness to the market.

The SBA is planning to have Gellman Research Associates repeat their study; but with some modifications, including an enhanced questionnaire, and a more structured sampling plan.\*

One can see some inconsistencies here with the findings of Krasner and Dubrow [1979], for example. It is generally difficult to compare research findings in this area since the sampling characteristics are significantly different. In any case, these results will play a role in the definition of our sample, as well as in the discussion of this research's findings.

From a different perspective, a number of studies looked at the rates of product innovation, and associated them with R&D

\* This information was obtained in a telephone conversation with William K. Scheirer of the Office of Economic Research at the U.S. Small Business Administration on September 28, 1988.

expenditures in order to gauge the firms' effectiveness and efficiency. See for example Rothwell's [1978] broad survey of the literature on "small and medium sized firms (SMEs) and technological innovation". Making a case for small firms, he notes that the "...new technology-based small firms ... play a major (though declining) role in the US, but only a minor role in the UK and West Germany" [1978:369].

Finally Ettlíe and Rubenstein [1987] characterized product radicalness, and looked at its emergence among various size firms. Citing some of the research already discussed here, they propose "...that it is the type of innovation that moderates the size-innovativeness relationship" [pp. 89-90].

They began with a compilation of products which had been recognized by trade and other publications, or had received awards, for their uniqueness. The corresponding firms were sent questionnaires so that additional information on the product could be obtained -- including, its technical and commercial success, the newness of the product and process technologies to the industry, and the ROI and market share achievement. All of the questions dealing with these areas -- there were 12 -- were perceptual. A drawback in the methodology, as noted by the authors, was that large firms are perhaps more likely to have their innovations publicized. Another weakness may be the that

the questionnaire respondents from firm to firm were too diverse — i.e., they included CEOs, scientists, public relations directors, among others — providing a different perspective from product to product. The results of Ettlíe and Rubenstein's survey are summarized as follows:

...as firms grow from between 1,200 and 11,000 employees, they are significantly more likely to introduce radically new products which, in turn, are more likely to be successful than incremental new products.... However, firm size was not found to be directly and significantly related to the success of new products, and firms up to 1,000 employees were found to introduce both radical and incremental new products [1987:100].

On the basis of these results, and data that they received on the adequateness of product development funding, Ettlíe and Rubenstein [1987] reasoned that mid-size firms may be best able to carry forth the development of radical products because they are large enough to have the required resources, yet small enough to not be bureaucratically burdened.

#### Success Factors in Product Innovation

As mentioned earlier, SAPPHO and Project NewProd looked at pairs of new products — one successful product and one failure, aimed at the same market — and, through a survey, drew conclusions about the effectiveness of the firms' product

development capabilities [Cooper, 1983]. Combining and slightly generalizing the results of these two studies, the factors highly associated with successful innovations were found to be:

1. a market orientation (need recognition and satisfaction);
2. effective internal and external communication;
3. existence of a strong product champion;
4. sophisticated decision-making techniques;
5. well planned venture management; and
6. an efficient product development process --

not necessarily in that order [Cooper, 1983:4]. These findings have some relevance to the findings of this research, and are invoked further on.

\* \* \* \*

This literature review has introduced the research that is most closely related to this effort. It has played a significant role in the development of the sampling plan and the questionnaire; and has provided the basis for the hypotheses presented below.

### Hypothesis Development

#### General

This section develops hypotheses that are intended to place ICV strategies in a meaningful context, and to characterize their performance.

## Success

While we did not expect to see a great deal of variation in success overall — since we used products actually commercialized as the focus of our questionnaire — we were hopeful that there would be discernible differences between the internal venture groups (ICV), mainstream divisions (MDIV), and small firms (SF); and significant differences within the ICV group.

Biggadike [1979], von Hippel [1977], Weiss [1981], and Fast [1981], noted in various ways, that ICV efforts are largely unsuccessful. Due to this, and on the basis of the pilot study for this research the following hypothesis is proposed:

- H1: The products generated by ICV groups are less successful than those generated by the mainstream organization.

Based on the findings of von Hippel [1977], Pinchot [1983, 1987], Weiss [1981], and Roberts [1988], who found that a product champion's involvement in the venture was crucial to its success, we propose:

- H2: The existence of a product champion from the outset of the venture will lead to more success than if a champion were not initially involved.

## Diversification

Small firms are usually simple structures (see Mintzberg, 1979) run solely by a single top person; and, the "planning" of entrepreneurial activity is usually headed by this person [Miller, 1983]. It is likely then, that small firms experience less diversification than large firms, focusing rather on the core technology and markets most familiar to their founders. Accordingly we offer the following hypotheses:

- H3A: Small firms' products represent a less diversification for their firms than ICV groups' products do for theirs.
- H3B: Mainstream divisions' products represent less diversification for their firms than ICV products do for theirs.

Using similar reasoning, we offer the following, perhaps more speculative, hypothesis:

- H3C: The differences in diversification represented by the products of small firms compared to those of MDIVs is insignificant.

Finally, regarding diversification, we paraphrase a rather complex hypothesis proposed by Burgelman and Maidique [1988].

- H4: In ICV organizations, products with: a) low strategic significance and representing high diversification are likely to be spun off; b) moderate strategic significance and representing moderate diversification are likely to remain within the venture group; and c) high strategic significance and representing low diversification are likely to become assimilated into the mainstream organization.

This hypothesis is treated in a highly exploratory manner since there does not appear to be a generally accepted definition of "strategic significance". (It would be reasonable to assume that strategic significance is the degree to which a product serves the long term needs of the firm.) We propose a definition based on the factors that we derived.

#### Product Radicalness

The next three hypotheses hinge largely on the findings of Ettlíe and Rubenstein [1987]. Recall that they found that medium size firms were more likely to generate radical products than small or large firms. They speculated that this is probably due to these firms being significantly less bureaucratic than very large firms, yet having the resources to develop extraordinary, and therefore probably more risky, products. ICV organizations would appear to have the advantage of smallness — i.e., little bureaucracy — while having access to many resources. Accordingly, the following hypotheses are stated:

H5A: ICV groups generate products that are more radical than those generated by MDIVs.

H5B: ICV groups generate products that are more radical than those generated by SFs.

H5C: The difference in the radicalness of products generated by MDIVs versus SFs is insignificant.

\* \* \* \*

The testing of these hypotheses (see chapter 5) will help to focus our analysis by establishing pertinent relationships among the internal venture, mainstream, and small firm groups.

\* \* \* \*

## CHAPTER 3

## QUESTIONNAIRE DESIGN METHODOLOGY

Introduction

Due to the uniqueness of the questions addressed in this study it became necessary to completely design an appropriate questionnaire. This involved the development of constructs — i.e., a group of characteristics that together define a certain quality — that could be inferred, albeit roughly, from the literature in the various disciplines relevant to our topic. The nature of these theoretical constructs, as it were, necessitated the inclusion of a significant number of perceptual items. Additionally, a number of direct questions were desired so that some contextual data would be available for an enhanced discussion of the statistical results.

In addition to searching the literature in order to "rough out" the constructs, this author interviewed a number of colleagues in other institutions who were familiar with the relevant literature. They were given outlines of the constructs and the proposed items, and asked to comment. Finally a pilot study was conducted that not only allowed us to reasonably establish the reliability of the questionnaire, but helped in the assessment of how broad a scope the survey should take. The

survey procedure, including the make-up of the structured interviews, was also determined at this time.

Each of the steps in the design of this research, will be discussed in turn, including an explanation of the rationale behind the definition of the sample, and the selection of a statistical package.

### Development of the Theoretical Constructs

#### General

We desired to develop constructs representing the variables found in the hypotheses. Ideally these constructs — or factors, statistically speaking — would be found to be commonly characterized by certain vocabulary sets in the literature [Babbie, 1973:131-136]; and, would statistically "hang together" once subjected to the coefficient of alpha method [Van de Ven and Ferry, 1980:78-79], and/or factor analysis [Tull and Hawkins, 1987:530-532].

The literature and a number of colleagues provided many insights regarding the definition of constructs — in terms of questionnaire items — that are likely to be generally acceptable. As suggested by Churchill [1979:66], this is a good way to begin. We shall deal with each of these proposed, or

theoretical, constructs in more detail here; and generally proceed in accordance with Churchill's "suggested procedure for developing better measures" [1979:66] — an adaptation of which appears in figure 1.

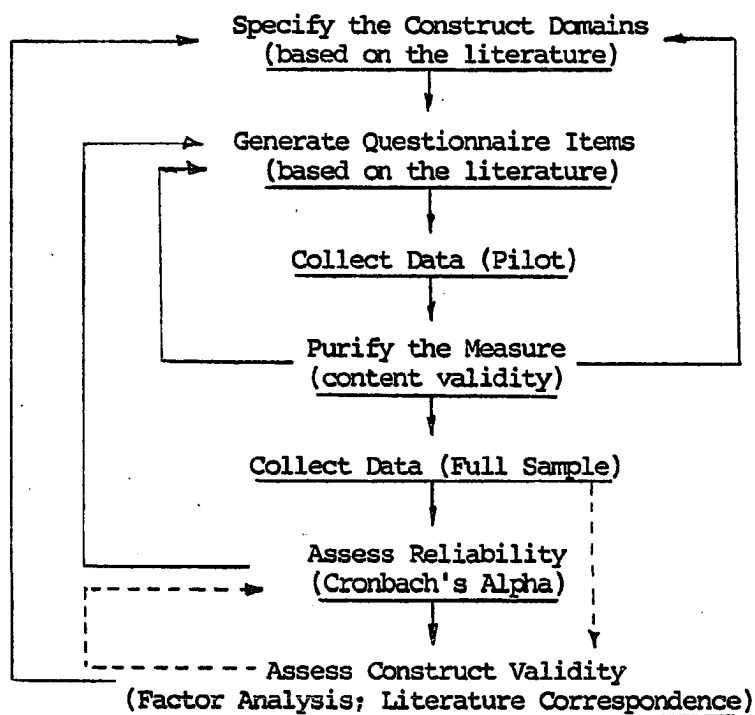


FIGURE 1 — A Procedure for Developing an Accurate Measuring Instrument

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Referring to figure 1, we begin by specifying the construct domains. Here one must rely on the literature, and then select those that appear to best facilitate the research at hand. In our case these are as outlined below:

- I. Product Attributes
  - A. Success/Failure
  - B. Radicalness (with respect to the market)
- II. Diversification (Represented by the Product)
  - A. Organizational (in terms of management and required skills)
  - B. Technological (in terms of the sources of product and process technology)
- III. Orientation of the Venture Manager (basically process versus goal orientation)
- IV. Organizational Differentiation (distinctiveness and physical separation)
- V. Organizational Integration (the degree of collaboration)
- VI. Product's Industry Environment (the degree to which it changes)

In effect we have six different questionnaires since each domain addresses quite distinct, albeit strategically related, aspects of the firm. These distinctions will become clear as we discuss the originally proposed items selected for each domain, and sub-domain, on the basis of the literature.

We will proceed by looking at each item and the literature

supporting its association with each "proposed variable", or construct.

### Product Success

"Organizational Synergy" was, in a sense, proposed as a measure of success by Maidique & Zirger [1984]. They suggest that ventures should not merely be judged on the quantifiable aspects of success, but that some assessment ought to be made regarding their contribution to the organization's ability to handle similar future efforts — i.e., to meaningfully enhance organizational learning. Hence we have included the item reading "product effort paved the way for future efforts".

The items "return on investment projections look promising" and "market share growth rate looks promising" are based on the widespread use of market share and return-on-investment as criteria for product success. Biggadike [1979] uses these for assessing various types of new venture strategies. The word "promising" was used for both of these items since the commercialized products being focused on by the questionnaires would most likely be at different stages of their product life-cycles.

The item "product concept and market were a good match" is intended to measure the degree to which the need for the product

was accurately determined. Cooper's [1983] comprehensive review of the research found that with respect to industrial products, "need recognition, understanding user needs, undertaking market assessment and market research, and having a sound knowledge of the marketplace were prevalent findings, common to virtually every study" [p. 5]. Von Hippel's [1978] classic analysis of "Successful Industrial Products from Customer Ideas" introduces what he termed a "customer-active" paradigm. Here the customer actually plays a direct role in product development by explicitly proposing product ideas to the firm; whereas, the "manufacturer-active" paradigm relies on surveys trying to (less directly) determine customer needs and to translate them into product ideas. Similarly, a number of marketing textbooks (see for example Kotler, 1985) emphasize the need for a product concept and market fit with respect to consumer products.

In a study of his own on the major reasons for industrial product failure (based on 114 products) Cooper [1983] found that "technical difficulties and deficiencies" with the product accounted for 20.5% of the product failures. The remaining failures were due to: "underestimated competitive strength and/or competitive position in market (36.4%); overestimated number of potential users (20.5%); and product's price set too high (18.2%)..." [Cooper, 1983:2]. The item "product met its

originally targeted technical specifications" is intended to capture this dimension of success.

### Product Radicalness

Our intention to distinguish product radicalness from firm diversification led us to include items characterizing the product's distinctiveness with respect to external environmental factors. So, as mentioned and illustrated in the literature review section of this study (see figure 1, page 18) we are following Heany's [1983] guidelines to a large extent. The items "product technology was new to the industry", "process technology for this product was new to the industry", and "functionally equivalent products existed in the marketplace" (all preceded by "at the time of commercialization") gauges the newness of the product, period.

Gobeli and Brown [1987] found that radicalness versus incremental product innovations are judged by producers and customers to be different on the basis of the novelty of their technology and their benefits — i.e., a radical product is perceived by the industry to have a high degree of new technology; and from the customers' standpoint to have highly increased benefits. Note, that "increased benefits" can reasonably be interpreted as positive new functionality. We

chose the term "functionally equivalent" because a questionnaire item indicating newness, and not necessarily desirability or success, was desired.

Finally Ettlíe and Rubenstein [1987], in their study addressing firm size and product radicalness, measured radicalness on the basis of the degree to which product and process technologies were a "significant break from past knowledge", and where the firm in question ranked in terms of a product's introduction. These criteria roughly parallel those we have chosen.

#### Organizational Diversification

In this section we are interested in the requirement for new skills by the firm, or by the group developing the product in question. It is well known that the adoption of new promotional skills and distribution channels signifies diversification. However, the notions of technical skill transfer within the firm, and the securing of top management commitment as signifying diversification warrants some discussion.

It is reasonable to assume that top management will be reluctant to support that which is most foreign to them, and involves risk and organizational change. This would be especially true in financially rough times. MacMillan and George

found that "in company after company, attempts at new venture development efforts have failed abysmally because management cut back on critical resources when the rest of the organization fell on hard times" [1985:39]. On the other hand, Bart's [1988B] findings suggest that top management support internal venture projects that are "as unrelated as possible to the corporation's existing products" [p. 36] because supporting projects which do not represent a significant degree of diversification will engender unhealthy rivalries between the venture manager(s) and other managers at similar levels. Then, too much support for the venture manager, as Fast [1979] quite reasonably points out, might offend the non-venture managers in the corporation.

There are obviously a number of dynamics involving the degree to which one ought to be supporting the venture manager. Given this, we have included "top management commitment was easily secured" as a strictly exploratory item under "diversification represented by the product".

Regarding the item "new technical skills were adopted" we offer the rationale put forth quite comprehensively by Bart:

... there is a growing body of evidence suggesting that unrelated diversified companies generally underperform their related diversified counterparts. This is because they lack the ability to transfer skills ... For example, IBM was quickly able to fill its human

resource needs for the IBM PC from the ranks of existing employees. Exxon, on the other hand, took over three years to staff its Vydec word processor group — an unrelated NVU [new venture unit]. [1988:37]

Since we are dealing with firms that have commercialized their products, implying a significant degree of success in most cases, it is reasonable to assume that the transfer of skills will then be most associated with the degree of "diversification represented by the product" — hence its inclusion under that heading in the questionnaire.

#### Product/Process Diversification

In an extensive analysis of the literature dealing directly and indirectly with relatedness, Kazanjian and Drazin [1987] identify relationships between internal diversification strategy and organizational characteristics. Referring to relatedness (or conversely diversification) in the context of internal corporate venturing, they cite Burgelman, noting his characterization of it as "operational relatedness". This is to differentiate the type of diversification achieved through acquisitions or joint venturing. They conclude that internal diversification involves "a shared vision of a new business idea" and therefore:

Knowledge must be developed in the three primary functions of the firm, broadly defined as: (a) marketing (market research, sales, customer service, promotion); (b) product technology (engineering and research and development); and (c) process technology, manufacturing, materials, quality). [Kazanjian and Drazin, 1987:347].

A pictorial representation of this three-dimensional concept of internal diversification presented by Kazanjian and Drazin appears in figure 3 of chapter 2.

To keep our questionnaire from becoming too lengthy, we decided to include only two items corresponding to the above -- "source of process technology was internal" and "source of product technology was internal". Note that here, unlike under product radicalness, we are looking at the "source" of the technology instead of its newness to the industry or market respectively. This is intended to help us differentiate between product radicalness and the diversification necessitated by the product's development. Finally, note that the marketing dimension is discussed above -- we shall have to await the results of a factor analysis to more precisely determine the identity of the construct that should include this item.

The last item in this section, "expected product life-cycle similar to mainstream products" is there to determine whether the product is expected to have a longevity that is significantly different from the firm's other products. Product life-cycle is a

very common designation in the strategy literature (see for example, Steiner et al., 1986).

### Venture Manager's Orientation

The venture manager's operating characteristics have been associated with the success of ventures. In a study comparing the performance of independent business start-ups with corporate start-ups Weiss [1981] found that "with respect to new ventures, the individually launched business ... places greater emphasis on ends than on means compared to established firms" [p. 51]. On the basis of interviews and financial data Weiss [1981] showed that the independent start-ups performed at least twice as well as corporate start-ups in such areas as sales growth and return on investment. MacMillan and George [1985] found that "venture managers need to be focused on output, not on analysis" [p. 40]. They go on to note that among the venture manager's chief concerns are "difficulty in securing internal support" and "impatience in the firm with the venture's progress" [p. 42]. Weiss [1981] also notes that "start-up management brings with it a need to be both extremely patient and extremely impatient ... An average — or constant — approach to patience is tantamount to inflexibility in this context, and it is to be avoided" [p. 51]. Finally, in their extensive review of the ICV and

intrapreneurship literature, David and Chanin [1989] found that the different ways a venture manager or intrapreneur were defined could be associated with the nature of the product expected from the venture effort.

What can be gleaned from the above is that venture managers ought to be very flexible individuals themselves; though this may not be a realistic expectation. Since the product innovations we were concerned with were reasonably successful, it was unlikely that we would have found significant relationships between the venture managers' orientations and success. Rather it was expected that the items describing the venture manager, namely, "took analytical approaches to most situations", "believed that goal definition resided in the minds of others", "was concerned with rules and procedural matters", and "was concerned with the future availability of resources" would have been more likely to indicate differences in the nature of the products.

#### Organizational Differentiation

Initially it was thought that the definition of differentiation developed by Lawrence and Lorsch [1967] could be adopted for this study. They used four dimensions, the first three characterizing managers, and the fourth the organization's

structure, namely, "orientation toward particular goals", "time orientation", "interpersonal orientation", and "formality of structure" [p. 11]. This rather complex definition was appropriate for their study because of its focus, and the feasibility of obtaining the extensive data required -- the sample size was six firms. In our case, we have tried to reflect the spirit of this definition with a relatively small (seven) number of items.

It had been suggested by a number of colleagues that indeed it would be very difficult to obtain data on differentiation as defined by Lawrence and Lorsch using a mail survey. It was recommended that we simply look at more explicit, or easier to observe measures of separateness, such as physical location and dedicated functional skills. This notion of having a number of discrete but conceptually related items was especially appealing given the findings of Hisrich and Peters [1986] regarding the "nature of new business venture units", or venture groups, based on a mail survey of 168 firms. In response to a question on the kind of functional areas present in each unit, the following data were gathered:

Ten were mentioned: marketing most frequently (45), followed by finance (28), and research and development (28). Others mentioned were: manufacturing, program management, budget, sales personnel, market research, and engineering. [p. 316]

Certainly "budget", "sales personnel", "market research", and "engineering" are often associated with marketing, finance, and research and development, respectively. On the basis of this research and the previous recommendations, and in conformance to a large degree with Lawrence and Lorsch [1967], the following items were included in the questionnaire: "venture group shared R&D people with the mainstream organization", "venture group shared marketing people with the mainstream organization", "venture group shared finance people with the mainstream organization", "location of the venture group was within the mainstream organization", and "venture group was a separate cost center".

Finally, perhaps the most sensitive issues for CEOs contemplating internal venturing efforts are the extents to which to differentiate the reward systems and the operating policies for the venture groups and the mainstream activities. As Quinn [1985] points out:

Rewards pose a special complexity. Most large concerns do not feel they can offer internal innovators the millions of dollars they might make if they successfully build their own companies. Lack of personal investment by the innovator and concerns about "fair play to others" are the reasons most often cited. [p. 273]

Also, more in line with the issue of differentiation based on operating policies, Quinn [1985], citing McClelland and Kidder, notes that:

The most innovative companies do recognize that innovative champions tend to work for more than just monetary rewards. They try to offer innovators significant personal recognition, independence in research, appropriate power or visibility within the company or within the division exploiting the innovation, or that most cherished of technical incentives — the right to a major role in the next big innovation. [p. 273]

These findings are at least partially corroborated by Block and Ornati [1987], who surveyed the CEOs of 42 Fortune 500 companies in various industries. They found that financial incentives for venture managers were not noticeably different in firms with successful and firms with failing ventures. Their recommendations, therefore, centered on methods for reducing the perception of internal inequities regarding compensation — implying that such perceptions could undermine the firm in the long term.

Finally, Bart's [1988 ], investigation of differentiation regarding venture groups found that loose organizational controls, as opposed to tight ones for the mainstream, and rewards based on recognition, as opposed to promotions for the mainstream, were reported as being the most effective.

It would reasonably follow then that including the items "venture group had the same reward system as the mainstream employees", and "venture group adhered to mainstream policies" is likely to enhance the assessment of differentiation between the venture group and the mainstream organization.

#### Organizational Integration

Once again we turn to Lawrence and Lorsch [1967] who provide the following definition for integration:

the quality of the state of collaboration that exists among departments that are required to achieve unity of effort by the demands of the environment. [p. 11]

In a questionnaire supplied by Miller [1983]\*, integration is defined in a similar manner, namely, as being a way of:

... assuring the compatibility amongst decisions in one area (e.g. marketing) with those in other areas (e.g. production).

\* I am indebted to Danny Miller of McGill University, in Montreal, for sending me a copy of his questionnaire.

In what amounts to an at least partial validation and an extension of Lawrence and Lorsch's [1967] work on differentiation and the importance of appropriate integration, Galbraith [1977] identified the four integrating mechanisms used in Miller's [1983] questionnaire. These are the four we have adopted, namely, "interdepartmental committees", "liaison people", "task forces", and "regular meetings". These are preceded by the question: "to what extent were the following integrative mechanisms used between the mainstream organization and the venture group?"

#### **Product's Industry Environment**

To assess the product's industry environment we adopted, with some minor modifications, the portion of Miller's [1983] questionnaire dealing with "environmental dynamism". This includes the items, "marketing practices change frequently", "product obsolescence rate is high", "actions of competitors are difficult to predict", "forecasting customer demand is difficult", and "modes of production are frequently changed". This portion of Miller's questionnaire was intended to measure the dynamics of environments confronting entrepreneurial organizations.

\* \* \* \* \*

The questionnaire items discussed above were responded to on a scale of 1 to 7; the lower end indicating little or no agreement, and the higher end indicating total or extreme agreement with the statement.

We had basically completed Churchill's [1979] first two steps for developing a better measure by generating items which captured the specified domains. We used the literature as a guide on how the variables had previously been defined. The next section describes the steps taken to purify and assess the reliability of the questionnaire.

### Designing the Questionnaire

#### **The Objective Items**

There are a number of fill-in questions requesting the identity of the firm and the respondent; the age, size (number of employees), source of funding and number of products commercialized; and where commercialization of the product will most likely be taking place. With the exception of the last item, this information was used to help verify the integrity of the perceptual responses — and, it may prove to be valuable in designing extensions to this research.

The remaining fill-in questions appear on the first page of

the questionnaire and are designed to determine the relationship of the intrapreneur and the venture manager, and the origin of the product concept.

The questionnaire described above is the one intended for internal venture groups. The versions for mainstream divisions and small firms include only the perceptual items dealing with product attributes, diversification, and the product's industry environment. Also, they do not include the fill-in questions that pertain to internal venturing.

All three versions of the questionnaires, preceded by a sample cover letter and brief descriptions of the research that accompanied each one, are reproduced in Appendix A.

#### Purifying the Questionnaire

To help assess the integrity of the questionnaire, copies were distributed to friends and colleagues for comments. Also among the participants in this effort were four Fortune 500 firms that had used internal corporate venturing strategies, and two independent small firms on Long Island. During this process questionnaires were resubmitted to the same people to see if the responses were consistent with their previous ones; and they were asked to identify ambiguous questions or statements. "Content

Validity" was checked by asking the respondents if the structure and content of the questionnaire made sense -- i.e., did it look as if the data obtained from this instrument could provide someone with some meaningful information?

Finally a pilot study was conducted in order to finalize the questionnaire design, and to assess the feasibility of the entire research project. The final steps for assessing reliability and construct validity are discussed in chapter 4, where there is a summary of the qualitative factors insuring reliability; and chapter 5 where the factor and Cronbach alpha analyses appear.

\* \* \* \* \*

## CHAPTER 4

## SURVEY AND DATA ANALYSIS METHODOLOGY

Sample Characteristics

## Industry Scope

The industries were selected according to the designations of the 1988 Fortune 500 [1989] listings and include: Chemicals; Computers, including office equipment; Electronics; and, Scientific and Photographic Equipment. We eliminated the Aerospace industry due to its dominance by long term government contracts; and, the Pharmaceuticals industry, which is reputed not to encourage internal venturing activities due to the extremely high costs associated with development and FDA approvals.

The industries finally selected are referred to here as "high technology" industries simply on the basis of their research and development (R&D) expenditures. Maidique and Zirger [1984] used the criterion of a minimum of 3% of total revenues expended on R&D as indicating a high technology firm. We have chosen a more conservative 5%, and made our selection on the basis of the R&D intensity of the top three firms in each of the industries. The small firms selected were also in the

industries just identified.

#### Firm Selection

The large firms -- the firms we are researching regarding their internal venturing activities -- were selected from the Fortune 500 listings in the industries described above.

\* \* \*

With regard to the selection of the small firms, it was first necessary to identify the states we wished to survey. To limit the search, and to perhaps make the selection more meaningful in terms of the goals of this study, we chose states on the basis of the number of "scientists and engineers employed per 10,000 population" [Brizius and Foster, 1988: table M-5]. The top ten states chosen are:

Connecticut  
Massachusetts  
Colorado  
Delaware  
Maryland  
Washington  
New Jersey  
California  
New Hampshire  
New York

and are here termed "high technology states". One could reason that these states provide environments for the firms that are conducive to the flow of resources and critical human skills necessary to support high technology venturing -- as is the case within the Fortune 500 companies. It is of course useful to control variables as closely as possible -- in this case we have attempted to eliminate some of the extraneous effects that might be due to the availability of resources from the firms' external environments. Finally, the states selected proved to be desirable in another sense. One can readily see that the states are broadly distributed geographically -- i.e., they represent the Western, Midwestern, and Eastern Regions of the United States.

The firms in each state were selected in a nearly random manner. Note that these were all small firms -- i.e., having fewer than a total of 500 employees\* -- and independent -- i.e., not subsidiaries or divisions of larger firms where the total number of employees exceeds 500. Also, we targeted manufacturing firms which were not subcontractors -- as was the case for the large firms. Finally each state's "Manufacturer's Directory"\*\*

\* We are using the Small Business Administration' definition of small firms [US Small Business Administration, Office of Advocacy, 1981].

\*\* These are listed in the references under each state's name.

was used as the source of firm information. Quite often, however, the information in these directories was lacking in the necessary detail -- such as the key employees' names, whether the firm was independent, etc. -- so that at least 16 firms (4 in each industry) were selected to help insure that there would be a reasonable chance of contacting a suitable firm and receiving a valid response to our questionnaire.

### Size

The required sample size can be roughly estimated according to the needs of factor analysis [Kachigan, 1986:384] and three-group MANOVA [Stevens, 1986:189, 465]; however, a great deal of leeway is possible due to the large influence of sample variances. In our case we had endeavored to obtain responses numbering at least three times the number of questionnaire items appearing in any of the questionnaire domains. With eight items, for example, this would translate into at least 24 responses for each group, or a total of 72. (In terms of useable responses, we managed to obtain more than 50 in each of the two large firm groups, and more than 70 questionnaires in the small firm category.) The response characteristics are discussed in detail in the next chapter.

### Survey Procedure

The data was gathered using a combination of structured telephone interviews and mailed questionnaires — see figure 1. In the pilot study, which took place from January to April of 1989, it was found that verbally obtaining a potential respondent's commitment to participate significantly insured that he or she would not only respond, but that they would be personally filling in the questionnaire. The motivation for the respondent's participation may be explained by the "theory of social exchange". According to Dillman [1978],

The process of sending a questionnaire to prospective respondents, getting them to complete the questionnaire in an honest manner and return it can be viewed as a special case of "social exchange"... The theory of social exchange ... asserts that the actions of individuals are motivated by the return these actions are expected to bring and, in fact usually do bring from others. [p. 12]

The return available to the potential respondents in our case was an executive summary of the results of this research. An outline of the topics discussed during the interviews appears in figure 2.

THE SURVEY PROCEDURE

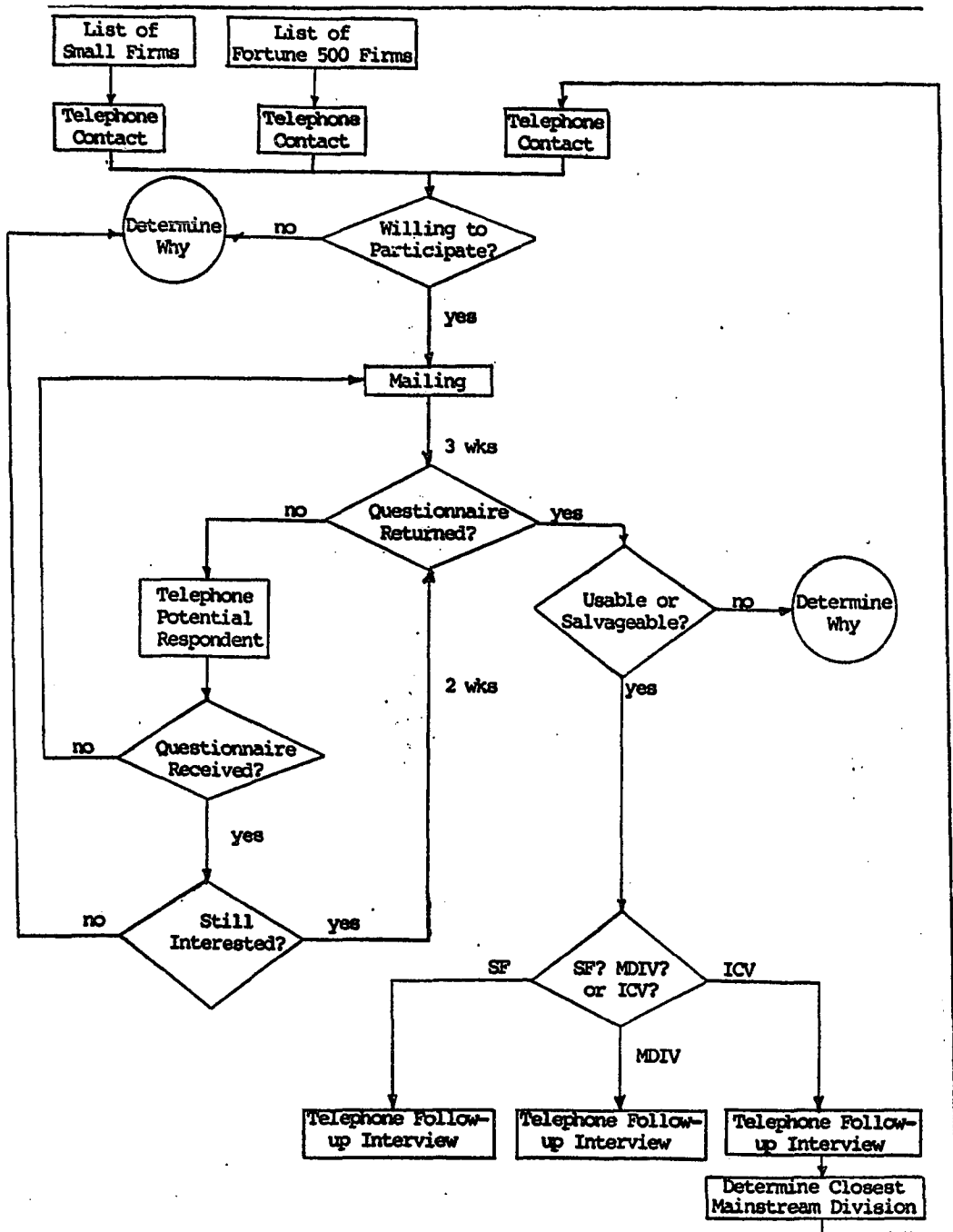


FIGURE 1 — A Flowchart of the Survey Procedure

The initial telephone interviews were additionally necessary in the case of the large firms, as the identification and location of those involved in internal corporate venturing efforts was not at all straightforward. Also, upon contacting the person thought to be the appropriate individual, it was often quite necessary to first explain what "we meant by ICV". A transcript of this explanation reads as follows:

Internal venturing, as opposed to external efforts, such as joint venturing, acquisitions, the use of venture capital, etc. — is intended to get the firm into new product areas through the use of mainly existing (internal) resources. Organizationally, this strategy has been found to exist to varying degrees of formality. Least formally, a group of employees would, to some degree, be allowed to work autonomously — usually outside what are considered to be the traditional (mainstream) R&D efforts — to develop a new product that is likely to be significantly unrelated to the firm's existing products, due to its inherent technology and/or the markets it would serve. As the product concept shows promise, the "venture group" may acquire additional resources, such as marketing talent, a financial person, capital equipment, etc. It is well known that the 3-M Corporation is well established with at least the early stages of this type of activity. In the most formal sense, a "venture division" may be designated by the corporation to get the firm into a specific new business. Perhaps the best known example is IBM's setting up of what is now their PC Division. Here a group of about seventy IBM employees were given the appropriate resources, a significant degree of autonomy, and a mission to build a mass market microcomputer.

Regardless of where they fall on the informal/formal continuum, what basically distinguishes

internal venturing strategies is the expectation, or intention, of getting into a new product area using internal resources; and, an easily discernible degree of venture group (or divisional) autonomy with respect to the firm's policies and operating procedures.

The points that were most emphasized were the mission and the autonomous nature of the venture -- and the characteristic of its being solely conducted by the firm using internal product ideas and resources. Also, ICV appearing in the form of new venture divisions, quite often had to be differentiated from "small business units". The distinction made by the interviewer centered on mission and autonomy. New venture divisions are intended to get the firm into new businesses; whereas, small business units are established in order to better serve an existing product and market. Also, as pointed out above, NVDs generally have an observable degree of autonomy with respect to the firm's policies and operating procedures -- which is not usually the case for SBUs.

Finally, the targeted respondents for each ICV organization were upper level managers who had acted as venture ombudsman, or venture sponsors, and usually holding titles of vice president or senior vice president of R&D or Planning; and for the large firm mainstream organizations it was the head of the division, usually titled president or general manager. For small firms the

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 FIGURE 2 — The Structured Telephone Interview Process\*\*\*
 

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SMALL FIRMS

Initial

- Interview:
1. Size of Firm (50 - 500 employees)
  2. Age of Firm (eliminate infants)
  3. Independent Small Business?
  4. Mainly Not a Subcontractor?
  5. Type of Product
  6. Name, Title, and Address Information

Follow-up

- Interview:
1. Express Appreciation
  2. Clarification of Selected Responses

INTERNAL VENTURE GROUP

Initial

- Interview:
1. Potential Respondent's Role vis-a-vis Venture
  2. Explicitly set up to get firm into New Business(es)?
  3. Degree of Autonomy
  4. Existence of a Recently Commercialized Product?
  5. Name, Title, and Address Information

Follow-up

- Interview:
1. Express Appreciation
  2. Clarification of Selected Responses
  3. Identify Most Closely Related (in terms of Markets served and Technology Inherent in Product) Mainstream Division; and the Name and Telephone Number of its Head.

MAINSTREAM DIVISION

Initial

- Interview:
1. Confirm Product and Organizational Relationship to Venture Group
  2. Name, Title, and Address Information

Follow-up

- Interview:
1. Express Appreciation
  2. Clarification of Selected Responses

---

\*\*\* The telephone conversations usually included extensive discussions on the definition of ICV and the nature of this research.

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targeted respondents were either general managers, presidents, and vice presidents of R&D or Marketing. In all cases we achieved our target by better than 90% — i.e., fewer than 10% of the respondents held titles other than the one's mentioned; however, the interview process found them in all cases to be qualified enough in terms of their knowledge of the firm's products, markets, and organization to respond to the questionnaire. (A number of responses were disqualified, for a variety of reasons, and these will be discussed in the next chapter.)

#### Questionnaire Reliability

This brings us to step 6 of Churchill's "suggested procedure for developing better measures" [1979:66]. We will defer our discussion centering on the use of the Cronbach Alpha method for "purifying" the measure until the next chapter, where the data analysis results will be discussed in detail. We turn here to the qualitative factors of this research that helped to maximize the reliability of the questionnaire — these are:

1. A pilot study that involved several large and small firms, and a number of people from academia, asked the interviewees to comment on their interpretation of the questionnaire items. Some were administered a revised questionnaire, and the process was repeated until a consensus was reached.

2. Structured interviews before and after the questionnaire survey helped to insure the respondents' uniform interpretation of the questions.

3. The interviews were carried out by a single interviewer who was very familiar with the research, thus insuring an unusual amount of uniformity for this type of research in the interview process.

4. A homogeneous perspective on the part of the respondents was insured by having the questionnaire answered by either corporate VPs of R&D or planning for the ICV organizations; general managers or presidents of the mainstream divisions; and, presidents or VPs of marketing or engineering for the small firms.

5. The responses were by the intended respondents.

6. The questionnaire is not too long, and has a format that is easy to follow, and "makes sense" — thus making it more likely that it will be filled in with care.

7. The survey examined the actual occurrence of ICV and not simply one's perception of an intention to carry out such a strategy — i.e., the respondent was asked to provide an account of an actual experience with which he or she was intimately familiar.

8. The coding and the computer entry of the responses were done by one person, and checked by another.

It should be noted that test-retest reliability was not conducted due to its serious shortcomings (see for example, Zikmund, 1984; Tull & Hawkins, 1987; and Churchill, 1979; and Peter, 1979). Some of these are the effects due to the respondents' memories and changes in perception; the difficulty in reproducing the same test conditions; the adverse effects due

to the respondents' having to repeat their effort; etc. Churchill emphasizes that "... test-retest reliability should not be used" [1979:70]; though he, as well as others, suggest that factors external to the instrument be controlled. The benefits that may have been realized from a test-retest effort are believed to have been achieved here via steps one through six above, where we insured a significant degree of uniformity among the respondents.

Regarding the reliability based on the internal consistency (among the questionnaire items) of the instrument, Churchill had this to say with respect to the use of coefficient alpha:

All the sources of error occurring within a measurement will tend to lower the average correlation among the items within the test, but the average correlation is all that is needed to estimate the reliability. Suppose, for example, that one of the items is vague and respondents have to guess its meaning. This guessing will tend to lower coefficient alpha, suggesting there is error in the measurement. Subsequent calculation of item-to-total correlations will then suggest this item for elimination. [1979:70]

Reliability based on internal consistency of the questionnaire items was conducted using the Cronbach (or coefficient) alpha method. This was carried out using the entire sample, in addition to randomly selected sub-samples. This is discussed further, and the results of our analyses are presented, in chapter 5.

## Data Analysis Plan

### SPSS/PC+

Since this is an exploratory study involving the development of a questionnaire as well as the analysis of the responses, the data had to be coded in a manner that would allow the greatest possible flexibility in its manipulation. Also, a statistical package that could be easily accessed and used to carry out this exploratory effort, and still contained the capability to conduct the required advanced methods, was of paramount importance. The SPSS/PC+ version 2.0 package met all of these needs (see Norusis, 1988A, 1988B).

### Coding the Data

The lengthiest of the questionnaires, namely the one for venture groups, contains a total of 54 items, 41 of which were coded, and 35 out of the 41 being perceptual items. The 13 items which were not coded were write-in responses designed to support the perceptual responses. The perceptual items, which were scored on a scale of 1 to 7, were coded with variable names sequenced from V1 to V35. The 5 non-perceptual items have a numerical score keyed to the range of possible answers, and are coded with variable names sequenced from V36 to V40. The

identification and the possible scores for the 5 non-perceptual items appear in table 1.

<u>Variable</u> <u>Name</u>	<u>Score</u>	<u>Meaning</u>
V36	0	No Intrapreneur identified
	1	Intrapreneur and Venture Manager identified as the same person
	2	Intrapreneur and Venture Manager identified as different people
V37	3	ICV questionnaire
	6	Mainstream Division (MDIV) questionnaire
	9	Small Firm (SF) questionnaire
V38	2	Commercialization in Venture Group or New Division
	3	Commercialization in Spinoff Company
	4	Commercialization in Mainstream
	5	Commercialization Elsewhere
V39	1	Chemicals
	2	Computers
	3	Electronics
	4	Photographic & Scientific Equipment
V40	1	Origin of Product Concept Intrapreneur or Venture Manager
	2	Origin of Product Concept was R&D

TABLE 1 -- Codes for the Non-Perceptual Questionnaire Items\*

\* V37, V38, and V39 are common to all three questionnaire versions -- namely the ICV, MDIV, and the SF

### Data Analysis Overview

Finally we present a pictorial overview of the approach taken by this research — in figure 3. Indicated are the major steps and analytical techniques used in this study beyond the conducting of the survey.

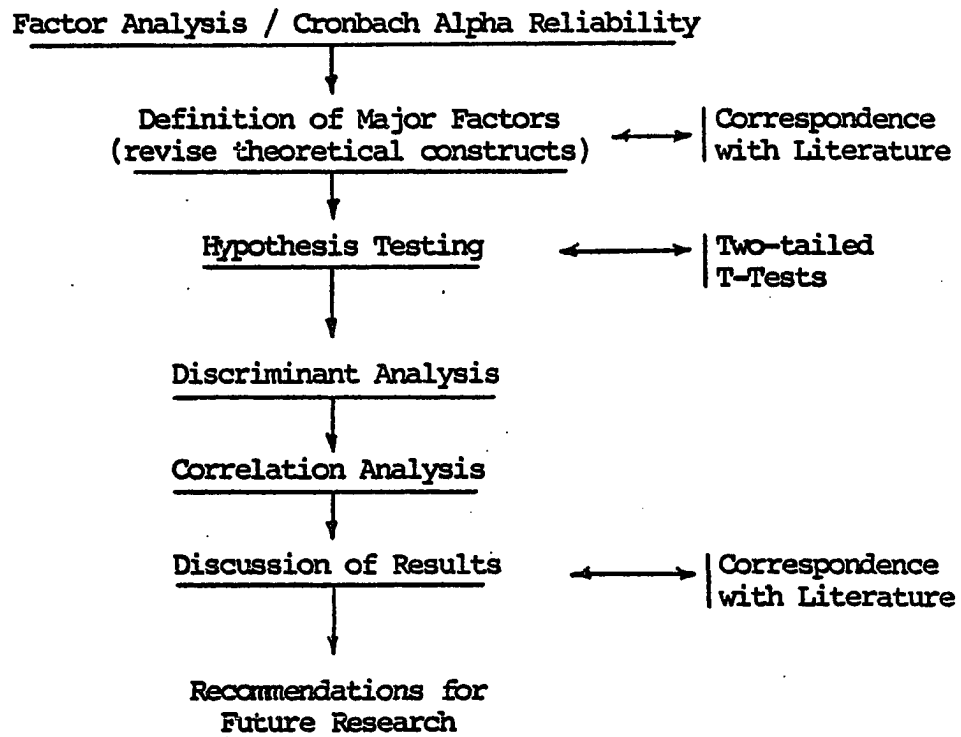


FIGURE 3 — Outline of the Post-Survey Research Process

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## CHAPTER 5

### RESULTS AND DISCUSSION

#### Introduction

This chapter presents the completion of the developmental work on the constructs proposed in chapter 3; and, the analyses of the data based on the revised definitions (variable content) of these constructs.

We begin with an overview of the survey's performance, including, the response intensity, and the respondents' and non-respondents' characteristics. Then the data that was gathered\* is used to finally establish the reliability of the questionnaire. This is followed by the definitions of the constructs upon which the major portion of the remaining analyses are based. These analyses include discussions of the findings' correspondence with the literature.

#### Survey Performance

As noted earlier, the targets of this survey included the ICV and mainstream division (MDIV) organizations of the 139 (1988) Fortune 500 companies in the electronics, chemicals,

\* All of the data was gathered during the period of February through October of 1989.

TABLE 1 — Survey Statistics for the Fortune 500 Firms

Sample	-- I N D U S T R Y --				Totals
	Chem.	Comp.	Elect.	Photo. & Sci. Equip.	
Total Firms	51	26	45	17	139
Firms not Interviewed*	9	3	16	2	30
Firms Interviewed	42	23	29	15	109
Non-ICV Firms**	14	4	11	3	32
ICV Firms	28	19	18	12	77
ICV Quest. Mailed	29	20	19	13	81
Usable ICV Responses*** (% of Mailed)	21 (72%)	9 (45%)	12 (63%)	9 (69%)	51 (63%)
Total & Usable MDIV Responses****	23	8	13	8	52

- \* Either because the appropriate corporate officers were unavailable for interviews; or, because there was no corporate level R&D function (due to the firm being clearly a holding company) — according to The Corporate 1000 [1989].
- \*\* Could not identify a recently commercialized product for which an ICV effort was responsible.
- \*\*\* One firm in each of the industries responded with respect to two different ICV activities.
- \*\*\*\* Two firms responded with respect to two MDIV activities in the chemicals industry, and one firm responded with respect to two MDIV activities in the electronics industry.

computer, and photographic and scientific equipment industries. The response statistics are presented in table 1. Recall that our procedure involved the immediate mailing of a questionnaire following the initial telephone interview in each case. This method, which explained the research and obtained a verbal commitment from each potential respondent, undoubtedly contributed to the high response rates that we experienced. (Tull & Hawkins [1987] noted that response rates appear to be affected by many factors —such as, questionnaire length, incentives for the intended respondent, etc. — and range between 13% and 75% for marketing oriented surveys.)

Among all of the industries, nearly 70% of the firms claiming to have used ICV responded with their questionnaires resulting in 51 usable responses. These responses represent a 63% response rate against the questionnaires that were mailed. Nearly all of the questionnaire-confirmed ICV firms responded to the MDIV questionnaire; and because in a few cases there were multiple responses the total MDIV responses exceeded the ICV responses by one.

The small firm (SF) response rates are summarized with respect to the firms' home states and industries, and are presented in table 2. Due to the sparseness of the information available for small privately owned firms, it was particularly

TABLE 2 — Response Statistics for the Small Firms  
by State and Industry

State	Quantity		USABLE RESPONSES BY INDUSTRY				Total
	Mailed	Returned	Chem.	Comp.	Elect.	Photo. & Sci. Instr.	
CT	11	10	1	4	0	2	7
MA	18	10	3	0	2	3	8
CO	19	12	1	4	3	3	11
DE	3	3	0	0	0	0	0
MD	16	12	3	3	1	2	9
WA	15	13	2	2	3	4	11
NJ	15	6	0	1	1	0	2
CA	18	11	1	3	2	1	7
NH	21	16	4	3	5	0	12
NY	10	5	1	1	0	2	4
	146	98	16	21	17	17	71

TABLE 3 — Survey Response Rates for All Groups

Group	Q U E S T I O N N A I R E S				
	Quantity Mailed	Quantity Returned	Quantity Usable	% Mailed Usable	% Returned Usable
ICV	81	56	51	63%	92%
MDIV	52	52	52	100%	100%
SF	146	98	71	49%	72%
Totals	279	206	174	62%	84%

difficult to find firms that qualified to participate. Delaware was an extreme example, with only three firms qualifying. A summarized account of small firm response rate performance is included in table 3, which provides the overall survey performance in terms of the response rates for each group.

Table 4 provides a view of the responses by the ICVs, MDIVs, and SFs in each of the industries, indicating at least a 15% representation for each industry in each group; and a 19% to 35% representation in each industry among all three groups.

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TABLE 4 — Extent to Which Industries are Represented by Usable Responses in the ICV, MDIV, and SF Groups

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Group	Chem.	Comp.	Elect.	Photo & Sci. Equip.	Totals
ICV	21 (41%)	9 (18%)	12 (24%)	8 (16%)	51 (29%)
MDIV	23 (44%)	8 (15%)	13 (25%)	8 (15%)	52 (30%)
SF	16 (23%)	21 (30%)	17 (24%)	17 (24%)	71 (41%)
Totals	60 (35%)	38 (22%)	42 (24%)	33 (19%)	174 (100%)

---

#### Non-Participants' Characteristics

For the firms contacted, those not qualified to respond — i.e., that had not had a recent experience with ICV resulting in

a commercialized product — provided an interesting cross-section of profiles. During the telephone interviews the officers of these firms each characterized their company's situation in one of the following ways:

1. As having a technological research agenda that is clear-cut and with a long time horizon; and, is faced with severe competition.
2. As a firm which finds itself in a volatile and varied technological environment, and already having highly decentralized R&D efforts.
3. A holding company — i.e., one whose main thrust is to achieve non-technological synergies through subsidiaries in a variety of businesses. (These firms do not have corporate R&D departments — or any other apparent means for supporting a core technology.)
4. As a firm whose top management has a low tolerance for activities as unstructured as ICV.
5. As a firm that has unsuccessfully tried ICV (and is now attempting to use such strategies as, venture capital efforts, joint venturing, and acquisitions and mergers).

#### **Non-Respondents' Characteristics**

The question of why firms that claimed to have used ICV did not ultimately respond, concerned us. Approximately 90% of these were contacted, after many trials, and at least two main reasons emerged regarding the lack of a response. On three occasions there were explicit reservations concerning confidentiality; on

two other occasions the firms were in the process of being taken over, and the "mood was not right"; and, the remainder said that they were simply too busy to take the time. Nearly all of these potential respondents had shown what appeared to be a real interest in the research during the telephone interviews, but indicated that the lack of time would be a factor in their ability to respond. Indeed during the initial interviews of those whom we were unable to contact a second time, most of the interviewees said that they would consider filling in the questionnaire once it was in their hands. To a reasonable extent, it seems that concerns about confidentiality and time were the main reasons for non-response.

Regarding the MDIV response rate, this was 100%, — probably due to the fact that someone else in the firm (in top management) had already participated in the survey.

Finally, the SF responses were relatively poor overall due to the following probable reasons: The reasearch focuses on internal venturing rather than small firms; there was a significantly higher concern in this group regarding the questionnaire's length; and, there also seemed to be a greater concern in this group for confidentiality. Quite often the respondents would not commit themselves over the telephone regarding the product they might discuss; and, many — again, especially in this group — made a point of not agreeing to fill

in the questionnaire before seeing it. Also, the concern for confidentiality appeared to have manifested itself in responses centering around a product "line", rather than a specific product, as requested.

### Questionnaire Reliability and Construct Validity

#### General

Earlier, in chapter 4, we discussed the issues associated with, what Churchill [1979] termed, purifying the measure, or the questionnaire — and we had already alluded to Churchill's "general procedure for developing an accurate measuring instrument" (see figure 1 in chapter 4). Churchill emphasizes that "coefficient alpha absolutely should be the first measure one calculates to assess the quality of the instrument" [1979:68]. Since this is an exploratory study, not only with respect to the hypotheses, but the questionnaire itself, we preceded the use of coefficient alpha with factor analysis. This helped us to initially select the variables defining each (theoretical) construct. We then subjected these (grouped) variables to the test for coefficient alpha.

#### Factor Analysis Results

Factor extraction, using principal components analysis, was

performed on the various domains of the questionnaire. Table 5A outlines the explicitly identified — i.e., on the questionnaire — domains, indicating the version(s) of the questionnaire(s) that included them, as well as the corresponding items (or variables).

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TABLE 5A — Questionnaire Domains & Variables

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Domain	Version*	Variables
1. Product Attributes	ALL	V1 to V8
2. Diversification Represented by the Product	ALL	V9 to V15
3. Orientation of the Venture Manager or Intrapreneur	ICV	V16 to V19
4. Organizational Differentiation	ICV	V20 to V26
5. Organizational Integration	ICV	V27 to V30
6. Product's Industry Environment	ALL	V31 to V35

---

\* ALL = ICV+MDIV+SF, where n = 51, 52, and 71 respectively

---

The following procedure was generally followed: First a factor analysis was performed on each of the six major domains identified in table 5A, using the full sample (n=174 for all three groups and n=51 for the only ICV-related variables) — the

assigned factor names are identified in table 5B; and the factor analysis results are summarized in tables 6A, 6B, and 6C for the variables included in all three groups, and in tables 6D, 6E, and 6F for the variables that pertain only to the ICV group. (The factor analyses appear in Appendix B.) This procedure was repeated using random sub-samples of  $n = 146$  for analyses involving all three groups, and  $n = 43$  for those involving only ICV.

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TABLE 5B — Assigned Factor Names

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**Product Attributes:**

SUCCESS = commercial success of the product

PRODPERF = product's technical performance and timeliness

PRODRAD = product's industry and market radicalness

**Diversification Represented by the Product:**

MKTGDIVR = marketing diversification experienced by the firm

TECHDIVR = technological diversification experienced by the firm

**Orientation of the Venture Manager or Intrapreneur:**

RSRCDIR = concerned with efficient use of resources

GOALDIR = action and goal oriented

**Organizational Differentiation:**

MKTGDIFF = venture group's marketing differentiation

PROCDIFF = differentiation in operations and policy matters

**Organizational Integration:**

INTGRATN = mainstream/venture group integration

**Product's Industry Environment:**

ENVVDYNAM = environmental dynamism faced by the product

---

TABLE 6A -- Factor Loadings for Variables Common to the  
ICV, MDIV, and SF Groups: The Product  
Attributes Domain

Variables	Factor 1 (SUCCESS)	Factor 2 (PRODRAD)	Factor 3 (PRODPERF)
V1	.78495*	.21515	-.10544
V2	.66912*	.01726	.49226
V3	.82230*	.16481	.22711
V4	-.06486	.12444	.88878*
V5	.37479	-.01421	.73393*
V6	.23683	.79260*	.09281
V7	.15490	.69346*	.01195
V8	-.01546	.76297*	.03530
Eigenvalues	2.85	1.50	1.04
% of Variance Explained	35.6	18.7	13.1
Cumulative % of Variance Explained	35.6	54.3	67.4

\* Variables initially used to interpret factors.

This procedure proved to be quite useful in helping us to identify the related variables. Moreover, the loadings in tables 6A through 6F differed only slightly with those obtained through the use of random subsamples -- i.e., the items defining each factor (with loadings of .5 or greater) remained the same, indicating somewhat robust conclusions. (Van de Ven &

Ferry [1980] suggest loadings of at least .4 using varimax rotation.) Varimax rotation was used in all cases, since this produced loadings which were easiest to see and interpret. (Stevens [1986] and Afifi & Clark [1984] provide intuitively appealing explanations of varimax rotation.)

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TABLE 6B — Factor Loadings for Variables Common to the ICV, MDIV, and SF Groups: The Diversification Domain

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Variables	Factor 1 (MKTGDIVR)	Factor 2 (TECHDIVR)
V9	-.31996	.23505
V10	.83087*	-.01125
V11	.42213	.40530
V12	.82662*	-.07089
V13	-.06256	.79971*
V14	-.06004	.86269*
V15	.50493*	.41502
Eigenvalues:	2.00	1.69
% of Variance Explained	28.6	24.2
Cumulative % of Variance Explained	28.6	52.8

---

\* Variables initially used to interpret factors.

---

TABLE 6C — Factor Loadings for Variables Common to the ICV, MDIV, and SF Groups: The Environmental Domain

Variables	Factor 1 (ENVDYNAM)
V31	.64464*
V32	.63055*
V33	.61998*
V34	.53694*
V35	.64047*
Eigenvalue	1.89
% of Variance Explained	37.9
Cumulative % of Variance Explained	37.9

\* Variables initially used to interpret factors.

TABLE 6D — Factor Loadings for Variables Found in the ICV Group Only: The Venture Manager Orientation Domain

Variables	Factor 1 (RSRCDIR)	Factor 2 (GOALDIR)
V16	.30111	.68652*
V17	-.28907	.71712*
V18	.70217*	.13614
V19	.71950*	-.13739
Eigenvalues	1.18	1.02
% of Variance Explained	29.6	25.6
Cumulative % of Variance Explained	29.6	55.2

\* Variables initially used to interpret factors.

TABLE 6E -- Factor Loadings for Variables Found in the  
ICV Group Only: The Differentiation Domain

Variables	Factor 1 (PROCDIFF)	Factor 2 (MKTGDIFF)
V20	.17938	.80875*
V21	.78608*	-.15704
V22	.52228	.53908*
V23	-.09950	.90580*
V24	.70307*	.42581
V25	.71094*	.39567
V26	.83290*	.03087
Eigenvalues	3.23	1.52
% of Variance Explained	46.2	21.7
Cumulative % of Variance Explained	46.2	67.9
* Variables initially used to interpret factors.		

TABLE 6F -- Factor Loadings for Variables Found in the  
ICV Group Only: The Integration Domain

Variables	Factor 1 (INTGRATN)
V27	.84559*
V28	.64854*
V29	.84783*
V30	.81708*
Eigenvalues	2.52
% of Variance Explained	63.1
Cumulative % of Variance Explained	63.1
* Variables initially used to interpret factors.	

### Coefficient Alpha Reliability

Coefficient alpha, or Cronbach's Alpha, as it is sometimes called, is concerned with the measurement error due to a lack of within-item consistency on the questionnaire. It looks at how well a group of preselected questionnaire items intercorrelate, and weights this intercorrelation with the number of items in the group. It is difficult to determine from the rotated factor loadings, or the communalities for each variable (these may be referred to in Appendix B), whether there would be a net gain in the strength of a construct if a particular item were to be deleted; whereas item selection is greatly facilitated using coefficient alpha. The SPSS output for "reliability analysis" (using Cronbach's alpha) for our factor-related variables is in Appendix C.

Van de Ven & Ferry [1980:79] note that "... common wisdom suggests that alpha should be somewhere between .6 and .9" for research dealing with organizational variables -- and for "broad constructs .35 to .70" [1980:266]. Citing Nunnally, Churchill [1979] notes that, "what is low for alpha depends on the nature of the research. For early stages of basic research, Nunnally suggests reliabilities of .5 to .6 suffice" [p 68]. We proceed to look at the results of our coefficient alpha analyses within this context.

We subjected the initial results of the factor analyses, whose outcomes are described in tables 6A through 6F, to the SPSS reliability analysis using Cronbach's alpha. The results of this "pruning process", where the alpha coefficient of the grouped items can in some cases be increased by deleting certain items, are summarized in table 7. Here we have the final configuration of our constructs.

Referring to table 7, we see that a number of variables had been eliminated, leaving us with nine constructs made up of at least two variables each. A total of 24 variables were retained. V1 ("product effort paved the way for future efforts"), while perhaps being a useful assessment in itself, is apparently open to a broader interpretation than V2 and V3 — which deal with "return on investment" and "market share" respectively.

V9 ("maximal technical skills transfer was possible"), V11 ("top management commitment was easily secured") and V15 ("expected product life-cycle similar to mainstream products") were quite judgemental compared to the other items under the diversification domain, and did not load significantly into any factors.

The most drastic deletions are perhaps V16, V17, V18, and V19. While these variables loaded decisively into two factors

(see table D), the alphas were .0321 and .2273 for factors 1 and 2 respectively. This was due to the very low correlation between the variables within each factor. Also these four variables did not load very strongly when a random sub-sample (n=43) was used in a factor analysis.

V22 ("venture group shared R&D people with the mainstream organization") was eliminated by the reliability test (and had a relatively low communality in the factor analysis). This might be explained by the fact that having a separate R&D group in a venture group is quite common [Hisrich & Peters, 1986], whereas the other variables under the differentiation sub-domain express conditions which are more varied.

Finally, V28 (the use of "liaison people") and V30 (the use of "regular meetings") were eliminated by the alpha criterion. The use of liaison people is perhaps not very common between venture groups and functional departments, however this bears further investigation. V30 could have remained and the alpha for INTEGRATE would have been .8231; however, removing it improved the construct's alpha to .8500. (Appendix C includes all of the Coefficient Alpha analyses referred to here.)

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TABLE 7 — Final Constructs as Determined by  
Factor Analysis and Cronbach's Alpha

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Constructs*	Variables Included	Alpha
SUCCESS	V2, V3	.7603
PRODPERF	V4, V5	.6244
PRODRAD	V6, V7, V8	.6452
MKTGDIVR	V10, V12	.7315
TECHDIVR	V13, V14	.7223
MKTGDIFF	V20, V23	.7500
PROCDIFF	V21, V24, V25, V26	.7865
INTGRATN	V27, V29	.8500
ENVVDYNAM	V31, V32, V33, V34, V35	.5812

Average Alpha = .7168

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### Hypothesis Testing

#### Discussion of Results

The hypotheses developed in chapter 2, which are restated below, were tested via two-tailed t-tests of the corresponding factor means for each group. (The arithmetic mean of the variables within each factor was used for the factor mean.) The results appear in table 8, and the SPSS outputs for each test can be found in Appendix D.\*

\* NB: Since we are performing multiple t-tests on given pairs of samples, it is important to account for the overall significance level for a given pair. Here we are using the "observed significance level", or p-value, for each test, which is "... the probability that a difference at least as large as the one observed would have arisen if the means were really equal" [Norusis, 1988B:B-122]. For those tests rejecting the null hypothesis, the sum of the p-values is  $<.05$  — see Appendix D.

TABLE 8 — Comparison of the Factor Means Across the ICV, MDIV, and SF Groups

Factor	ICV	MDIV	ICV	SF	MDIV	SF
SUCCESS	4.67	4.88	4.67	4.61	4.88	4.61
PRODPERF	5.04	5.32	5.04	5.03	5.32	5.03
PRODRAD	4.54	3.83***	4.54	4.06**	3.83	4.06
MKTGDIVR	4.02	2.82***	4.02	2.73***	2.82	2.73
TECHDIVR	2.78	2.59	2.78	2.85	2.59	2.85
ENV DYNAM	3.53	3.56	3.53	3.53	3.56	3.53

total n=174; ICV n=51; MDIV n=52; SF n=71.

two-tailed t-test results: \*\*\* p < .01

\*\* p < .05

H1: The products generated by ICV groups are less successful than those generated by mainstream divisions.

Success (SUCCESS) scores across the three groups, as expected, did not yield significant differences. As mentioned earlier, this is probably due to the design of the research, which asked the respondents to focus on their organizations' most recently commercialized product — i.e., we were looking at products which decidedly had a significant degree of success. The differences in means among all of the groups were not

significant enough to support H1.

The testing of H2, which also deals with success, is deferred to the section dealing with ICV sub-groups, where a detailed discussion of other findings among those groups will take place.

H3A: Small firms' products represent less diversification for their firms than ICV groups' products do for theirs.

H3B: Mainstream divisions' products represent less diversification for their firms than ICV groups' products do for theirs.

H3C: The differences in diversification represented by the products of small firms compared to those of large firms' mainstream divisions is insignificant.

Hypotheses H3A and H3B are supported with respect to marketing diversification (MKTGDIVR), but not with respect to technological diversification (TECHDIVR). Hisrich and Peter's [1986] finding that marketing was the most frequently present functional entity in internal venture groups lends support to the existence of marketing diversification in ICV groups. Technological diversification is essentially the same across all of the groups. This is consistent with the notion — as explained in chapter 2's development of this hypothesis — that large firms are bureaucratically governed [Mintzberg, 1979], and small firm entrepreneurship is governed by the top person [Miller, 1983] who is as unlikely as the bureaucracy to deviate

from the firm's core technology — hence, as expected, H3C is confirmed.

The testing of hypothesis H4 is deferred to the section dealing with ICV sub-groups, where related concepts and data are introduced.

H5A: ICV groups generate products that are more radical than those generated by mainstream divisions.

H5B: ICV groups generate products that are more radical than those generated by small firms.

H5C: The difference in the radicalness of the products generated by mainstream divisions versus small firms is insignificant.

Hypotheses H5A, H5B, and H5C are very strongly supported by the data. Ettlie and Rubenstein's [1987] notion that a firm must be large enough to have resources that can be comfortably risked on a radical product concept, but at the same time not so large as to be bureaucratically bound is quite intuitive, and probably true.

#### Significant Factors Within the ICV Sub-Groups

##### General

The results of the hypothesis tests encouraged us to seek out additional relationships among the factors across all three sub-groups within ICV. Additional t-tests were performed to establish the characteristics of three ICV sub-groups defined by

the existence and roles of intrapreneurs and venture managers. Then discriminant analysis was used to look for relationships among the factors most characterizing the groups and sub-groups, and to reveal the relative importance of these factors.

#### Identification and Analysis of the ICV Sub-Groups

As noted in chapter 2, hypothesis H2 is basically suggested by a great deal of literature which emphasizes the importance of a product champion for the successful development and commercialization of a venture product. Again, what has not been discussed in the literature are the technological and diversification characteristics of ventures with and without champions, especially in the initial stages; and, how and when the champion enters the picture.

In the 51 cases where the use of ICV was confirmed by return questionnaire, the pertinent write-in responses in 49 of these revealed the existence of three groups defined by the existence and relationships of intrapreneurs and venture managers, namely,

- A. No Intrapreneur (11 responses);
- B. An Intrapreneur who became the Venture Manager (18 responses); and,
- C. An Intrapreneur and Venture Manager who were different Individuals (20 responses).

This information along with that identifying the origin of the

product concept, suggest that intrapreneurs and venture managers can exist either sequentially or concurrently. Figure 1 pictures the relationships of these two roles, as well as that of R&D, against the stages of product development. Our data did not reveal, however, where the efforts of one party ended and the other's began; nor did we consider the role of the "momentum manager", who George and MacMillan [1985] identified as someone who oversees the long term commercialization of the venture.

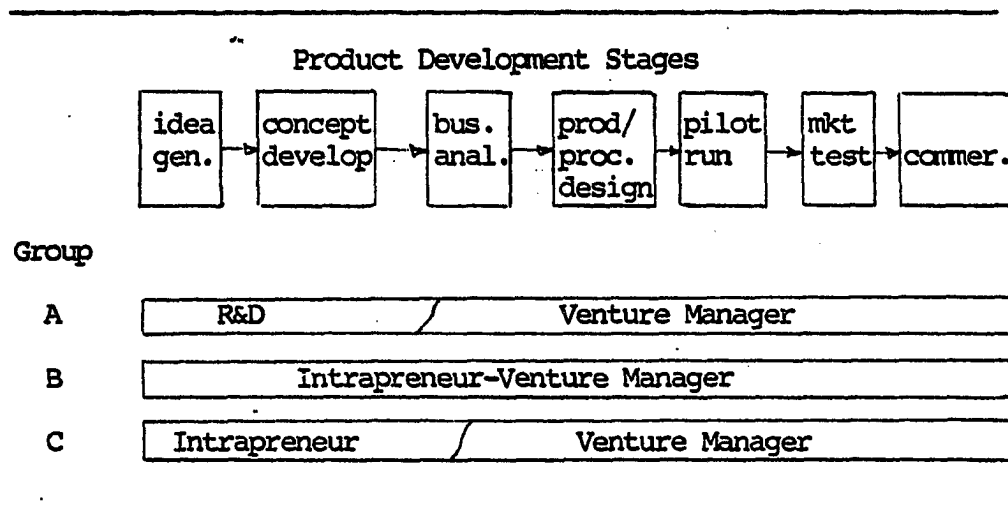


Figure 1 — Relationships of R&D, Intrapreneurs,  
and Venture Managers

#### Comparison of Factor Means

The perceptual data for the ICV sub-groups ( A: No Intrapreneur; B: Intrapreneur and Venture Manager the same

person; and C: Intrapreneur and Venture Manager different persons) are presented in table 9, and the detail of the T-tests can be found in Appendix E. Here we see a number of significant findings, which are discussed in turn.

We begin with hypothesis H2, which is largely supported:

H2: The existence of a product champion from the outset of the venture will lead to more success than if a champion were not initially involved.

TABLE 9 — Comparison of Factor Means for ICV Sub-Groups A, B, and C

Factor	A	B	A	C	B	C
SUCCESS	4.05	4.92**	4.05	4.85+	4.92	4.85
PRODPERF	4.64	4.44	4.64	5.38**	4.94	5.38
PRODRAD	4.36	4.46	4.36	4.80	4.46	4.80
MKTGDIVR	3.77	3.47	3.77	4.60+	3.47	4.60**
TECHDIVR	3.59	2.75+	3.59	2.45**	2.75	2.45
ENVVDYNAM	3.36	3.61	3.36	3.60	3.61	3.60
PROCDIFF	4.52	3.64+	4.52	3.11**	3.64	3.11
MKTGDIFF	5.41	5.11	5.41	5.20	5.11	5.20
INTGRATN	2.22	2.33	2.22	3.73**	2.33	3.73**

total n=49; A n=11; B n=18; C n=20.

two-tailed t-test results: \*\* p < .05

+ p < .15

In general it appears that the existence of an intrapreneur in the internal venturing process leads to a greater degree of success (SUCCESS). This is especially true for groups A versus B, and less significantly so for groups A versus C. This may be true because the intrapreneur is someone who arises spontaneously due to self-motivation, and therefore being more of a champion; as opposed to a venture manager, who appears to be someone who is "assigned" the role, or at least is part of a preconceived process — as pointed out in the literature review in chapter 2.

Where the venture manager is different from the intrapreneur, there is a significantly greater degree of marketing diversification (MKTGDIVR) (less significantly between A and C) and significantly greater organizational integration (INTGRATN). These results can be viewed as being consistent with our earlier results which indicated that the degree of MKTGDIVR distinguished ICV from MDIVs and SFs; only here, with the presence of an intrapreneur the difference is more pronounced. Also, there is a significant difference between group C and MDIVs and SFs with respect to PRODRAD (factor means of 4.80, 3.83 and 4.06 respectively with  $p < .006$  and  $p < .020$  respectively) — see Appendix F. Could it be that using a venture manager who is someone other than the intrapreneur represents the boldest form of internal venturing? Additionally, since INTGRATN is defined here in terms of intermittent contact — i.e., by

interdepartmental committees and task forces, as opposed to regular meetings and liaison people — we might conclude that there is less meddling on the part of top management, and perhaps this is the reason for the "boldness" of the group and their success — a concept consistent with the findings of Burgelman [1985] and MacMillan and George [1985], among others.

Finally, in the cases where the intrapreneurs who did not become the venture managers versus no intrapreneurs (groups A and C), product performance (PRODPERF) was significantly higher and technical diversification (TECHDIVR) significantly lower for the intrapreneurial organizations. A good example of this situation is the 3-M company's well known case of the Post-its Note Pad product, where the intrapreneur (Art Fry) used the firm's core technology to develop the product concept. Here the product performed very well, and the product/market match was excellent. We might conclude that an intrapreneur, fearful of not gaining top management support, sticks very closely to the firm's core technology, and bases his or her venture on getting the firm into new markets. Also, we might speculate that PROCDIFF being low and PRODPERF being relatively high would indicate that adherence to established procedures on the part of the venture manager — subsequent to the intrapreneurs development of the product concept — pays off in overall product success.

\* \* \* \* \*

At this point it is appropriate to examine and attempt to test hypothesis H4, which deals with the factors determining the location of the venture products long term commercialization.

H4: In ICV organizations, products with: a) low strategic significance and representing high diversification are likely to be spun off; b) moderate strategic significance and representing moderate diversification are likely to remain within the venture group; and, c) high strategic significance and representing low diversification are likely to become assimilated into the mainstream organization.

Interestingly, we found that among the 7 ICV products which were spun off, 6 were from group C. The remaining 42 products either remained with the venture group, or division, or were assimilated by a mainstream division.

If we consider strategic significance as "the degree to which a product serves the long term needs of the firm", we might define this factor by aggregating the product attributes that we have derived, that is,

$$\text{STRATSIG} = (\text{SUCCESS} + \text{PRODPERF} + \text{PRODRAD})/3.$$

For diversification we simply aggregated our marketing and technological diversification factors, that is,

$$\text{DIVERSIF} = (\text{MKTGDIVR} + \text{TECHDIVR})/2.$$

The results of the data analysis appear in table 10, and the details of the T-tests can be found in Appendix G.

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TABLE 10 — Strategic Significance & Diversification  
versus Ventures' Commercialization Location

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Factor	C o m m e r c i a l i z a t i o n    L o c a t i o n					
	NVD	Spin- Off	NVD	Main. Div.	Spin- Off	Main. Div.
STRATSIG	4.63	4.83	4.63	4.81	4.83	4.81
DIVERSIF	3.28	4.04**	3.28	3.32	4.04	3.32*

---

total sample ICV: n=51

two-tailed t-test results:    \*\* p < .05  
    \* p < .10

---

Clearly high DIVERSIF distinguishes the venture spin-offs from the other two commercialization locations, new venture divisions and mainstream divisions. STRATSIG does not differ significantly among these three groups. This partial verification of H4 does not say much about the entire hypothesis, except that we are perhaps "on the right track". An operationalization of strategic significance that accounts for a product's potential impact on the firm with respect to the firm's other products would probably be more meaningful. Also,

diversification might be defined to include administrative functions, such as, finance and material control. This is an interesting area for future research.

\* \* \* \* \*

These results present the policymaker with a picture of the factors that can be associated with the use of venture managers and intrapreneurs, and their outcomes. It is realized, of course, that the decision to allow an intrapreneur to fully emerge, or to have a venture manager succeed an intrapreneur during the product development process, may or may not be spontaneous. In either case, it would be useful to know the likely options and outcomes associated with such decisions, so that the strategist can pre-establish the conditions that would be conducive to the preferred strategy.

#### Characterizing ICVs, MDIVs, and SFs Using Discriminant Analysis

Discriminant analysis allows us to not only identify the factors which play the greatest roles in distinguishing the ICV, MDIV, and SF groups, but to see their relative importance as well. More importantly here, while the results of the t-tests revealed which variables are most significant among the three groups, one cannot be sure about the degrees to which the

remaining variables collectively contribute to distinguishing them. This is what we investigate next.

We first derived a discriminant function for each of the three possible combinations of the major groups -- ie., ICV and MDIV; ICV and SF; and MDIV and SF. This is compared with a discriminant function derived for all three groups (simultaneously) that reveals the relative importance of the procedure-selected factors. Finally, in the cases involving the ICV sub-groups, the limited sample sizes -- Stevens [1986] suggests a case to variable ratio of at least 20 to 1 -- makes the use of discriminant functions "risky"; however, this was tried to see if the outcome in terms of the variables used was consistent with the other analyses.

Table 11 summarizes the findings with respect to the various combinations of the three groups. Note that the groups that are most easily distinguishable, regardless of which method is used to obtain the variables, are the ICV and MDIV. These are followed by the ICV/SF and the MDIV/SF groups (see Appendix H for these results). The factors MKTGDIVR, PRODRAD, AND SUCCESS were tried for each of the group combinations since these showed up as the most prevalent predictors when discriminant analysis was performed across all three major groups using the Mahalanobis' criterion -- see Appendix I for these results.

TABLE 11 — Discriminant Function Classification Performance  
Among the Paired Combinations of the ICV, MDIV,  
and SF Groups

Factor	ICV/MDIV	ICV/SF	MDIV/SF
1	MKTGDIVR*	MKTGDIVR*	PRODRAD*
2	PRODRAD*	PRODRAD*	SUCCESS*
3	SUCCESS*	SUCCESS	MKTGDIVR
4	TECHDIVR*		
5	PRODPERF*		
<u>Classification Performance**</u>			
Selection by Mahal*	76.70% (.5029)	71.31% (.3744)	54.47% (.6669)
First three Factors only	72.82% (.1641)	70.49% (.3552)	56.10% (.9083)
All (6) Factors***	79.61% (.4322)	71.31% (.5165)	55.28% (.1106)

\* The Mahalanobis' distance criterion was used to select the factors for inclusion. Identical results were obtained using Rao's V, Between-Groups F, Wilks Lambda, and the Sum of Unexplained Variance methods.

\*\* Significance of Box's M Test for assessing the homogeneity of the covariance matrices is in the parentheses.

\*\*\* The discriminant function used here is most likely to be valid only for the cases used in its generation.

Discriminant analysis of the ICV sub-groups using Mahalanobis' criterion revealed the same important factors as

revealed by the t-test results, with the exception of PROCDIFF, which was excluded. The classification performance was 67.35%, with Box's M significance level at .9162. With PROCDIF included the performance remains at 67.35% with Box's M significance at .7510; and this leads to a less stable function. See Appendix J for the details of these results.

Returning to the results summarized in table 11, we find that ICV and MDIV are the groups most easily distinguishable, regardless of which set of factors are used in the discriminant function. (Table 12 provides the group classification breakdowns for the results arrived at using Mahalanobis' distance criterion for the selection of discriminant function factors. The results appear quite balanced.) Also, while the major predictors of organization type are MKTGDIVR and PRODRAD, with the exception of ENVDYNAM, all of the other factors play a significant role in identifying ICV. The discriminant function, using unstandardized coefficients, for ICV versus MDIV can be written as:

$$D = .4926(\text{MKTGDIVR}) + .4623(\text{PRODRAD}) - .2892(\text{SUCCESS}) + \\ .1593 (\text{TECHDIVR}) - .2360(\text{PRODPERF}).$$

Figure 2 illustrates the distribution of the values for the discriminant function (D) for all of the ICV and MDIV cases in our sample. This type of function, further developed, could be

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TABLE 12 — Classification Results for Combinations of the  
ICV, MDIV, and SF Groups Using the Mahalanobis'  
Distance Criterion for the Selection of Factors

---

<u>Actual Group</u>	<u>No. of Cases</u>	<u>Predicted Group Membership</u>	
		<u>ICV</u>	<u>MDIV</u>
ICV	51	38 74.5%	13 25.5%
MDIV	52	11 21.2%	41 78.8%
Percentage of "grouped cases" correctly classified: 76.70%			
		<u>ICV</u>	<u>SF</u>
ICV	51	35 68.6%	16 31.4%
SF	71	19 26.8%	52 73.2%
Percentage of "grouped cases" correctly classified: 71.31%			
		<u>MDIV</u>	<u>SF</u>
MDIV	52	29 55.8%	23 44.2%
SF	71	33 46.5%	38 53.5%
Percentage of "grouped cases" correctly classified: 54.47%			

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Correlations Among the Factors Within the ICVs, MDIVs, and SFs

The results of the correlation analyses produced a number of unexpected as well as intuitive results. Tables 12A, 12B, and 12C provide the Pearson Correlations for the factors identified in the survey of the ICV, MDIV, and SF groups respectively.

The general lack of factor intercorrelations in the ICV group is attributed to the non-homogeneous nature of the sample. Though ICV was easily differentiated from the other major groups, there was the surfacing of three quite distinct sub-groups based on the existence and roles of the intrapreneurs.

Among these sub-groups, only PROCDIFF and INTEGRATN intercorrelated significantly. It seems that the greater the differences in the venture and mainstream groups' operating procedures, the less frequently these groups will collaborate. Though this finding is contrary to the findings of Lawrence and Lorsch [1967] with respect to high performing organizations — probably because their study dealt with purely functional organizations — it is consistent with those of Burgelman [1983]. He found a significant lack of communication regarding strategic issues between the corporate level and the NVDs that he studied. This type of integration would have been most visible to our respondents, given their high level positions, usually as venture sponsors.

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**TABLE 13A — Pearson Correlations of ICV Factors**


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PROCESS IF (V37=3).

CORRELATIONS /VARIABLES SUCCESS PRODPERF PRODRAD MKTGDIVR TECHDIVR PROCDIFF

MKTGDIFF INTGRATN ENVDYNAM.

Correlations:	SUCCESS	PRODPERF	PRODRAD	MKTGDIVR	TECHDIVR	PROCDIFF
SUCCESS	1.0000	.2486	.0923	-.0852	.1027	-.1101
PRODPERF	.2486	1.0000	.1635	-.0798	-.0656	-.2038
PRODRAD	.0923	.1635	1.0000	.0650	-.1547	.1414
MKTGDIVR	-.0852	-.0798	.0650	1.0000	-.1202	-.1865
TECHDIVR	.1027	-.0656	-.1547	-.1202	1.0000	.1791
PROCDIFF	-.1101	-.2038	.1414	-.1865	.1791	1.0000
MKTGDIFF	-.1181	.1108	.2458	.0446	-.1174	.3156
INTGRATN	.1521	.0866	-.0643	.1463	.0289	-.5269**
ENVDYNAM	.2173	.0035	.0028	.0658	.0685	-.0009

Correlations: MKTGDIFF INTGRATN ENVDYNAM

SUCCESS	-.1181	.1521	.2173
PRODPERF	.1108	.0866	.0035
PRODRAD	.2458	-.0643	.0028
MKTGDIVR	.0446	.1463	.0658
TECHDIVR	-.1174	.0289	.0685
PROCDIFF	.3156	-.5269**	-.0009
MKTGDIFF	1.0000	-.2988	.1162
INTGRATN	-.2988	1.0000	.1097
ENVDYNAM	.1162	.1097	1.0000

N of cases: 51 1-tailed Signif: \* - .01 \*\* - .001

---

**TABLE 13B — Pearson Correlations of MDIV Factors**


---

PROCESS IF (V37=6).

CORRELATIONS /VARIABLES SUCCESS PRODPERF PRODRAD MKTGDIVR TECHDIVR ENVDYNAM.

Correlations:	SUCCESS	PRODPERF	PRODRAD	MKTGDIVR	TECHDIVR	ENVDYNAM
SUCCESS	1.0000	.4462**	.4648**	.3037	-.1026	-.0668
PRODPERF	.4462**	1.0000	.1619	.1158	.0009	.0384
PRODRAD	.4648**	.1619	1.0000	.3034	-.0909	-.0621
MKTGDIVR	.3037	.1158	.3034	1.0000	-.0038	.1394
TECHDIVR	-.1026	.0009	-.0909	-.0038	1.0000	.5095**
ENVDYNAM	-.0668	.0384	-.0621	.1394	.5095**	1.0000

N of cases: 52 1-tailed Signif: \* - .01 \*\* - .001

" . " is printed if a coefficient cannot be computed

---

**TABLE 13C — Pearson Correlations of SF Factors**


---

PROCESS IF (V37=9).

CORRELATIONS /VARIABLES SUCCESS PRODPERF PRODRAD MKTGDIVR TECHDIVR ENVDDYNAM.

Correlations:	SUCCESS	PRODPERF	PRODRAD	MKTGDIVR	TECHDIVR	ENVDDYNAM
SUCCESS	1.0000	.5561**	.2957*	.1904	-.2174	.1833
PRODPERF	.5561**	1.0000	.1824	-.0320	-.3633**	-.1059
PRODRAD	.2957*	.1824	1.0000	.2327	-.0806	.1614
MKTGDIVR	.1904	-.0320	.2327	1.0000	-.0302	.1783
TECHDIVR	-.2174	-.3633**	-.0806	-.0302	1.0000	-.1026
ENVDDYNAM	.1833	-.1059	.1614	.1783	-.1026	1.0000

N of cases: 71                      1-tailed Signif: \* -.01 \*\* -.001

" . " is printed if a coefficient cannot be computed

Among the major groups, SUCCESS and PRODPERF are positively correlated, though not significantly — an intuitively appealing finding. ENVDDYNAM is also weakly correlated with SUCCESS, perhaps indicating that venture groups are more likely to receive support, and therefore be successful, if they are operating in an environment that is relatively dynamic. These are interesting notions which beg further research.

PRODRAD and MKTGDIVR are not highly intercorrelated, in any of the three groups, and play the major roles in distinguishing ICV from MDIVs and SFs. This lack of correlation should not be surprising since it is possible to have a radical product and not have to diversify in the areas of marketing, namely in the

promotion and distribution functions — a good example is Sony's "Walkman"; and to diversify with respect to marketing, yet have a product which embodies product and process technologies which are not very new to the industry, and has a close functional equivalent in the marketplace — a good example is the IBM PC. In both of these instances the sources of the product and process technologies could have been internal or external; hence TECHDIVR is largely independent of PRODRAD and MKTGDIVR.

Interestingly, the prevalence of marketing diversification may indicate particular attention to market needs — a factor Cooper [1983], Maidique and Zirger [1984], and von Hippel [1979] found to be crucial to product success.

SUCCESS, PRODPERF, and PRODRAD are significantly related in the MDIV and SF groups — a highly intuitive result. As explained above, product radicalness can exist without diversification, and perhaps this is a key to success. In MDIVs alone, TECHDIVR correlates highly with ENVDDYNAM, indicating perhaps a greater willingness to diversify if the environment is uncertain; whereas, in SFs, TECHDIVR is negatively correlated with PRODPERF, indicating perhaps a lack of resources for handling technological diversification — a notion indirectly supported by Ettlief and Rubenstein [1987].

\* \* \* \* \*

The testing of a number of hypotheses; the exploration of the roles of intrapreneurs and venture managers; and, the use of discriminant and correlational analyses to illustrate strategic technological differences among internal venture groups, mainstream divisions, and independent small firms, have provided some foundations for future research. A summary and integration of this study's major findings, and additional recommendations for research, are presented in chapter 6.

\* \* \* \* \*

## CHAPTER 6

## CONCLUSION

The Study's Findings

The literature on new venture strategies has given little attention to technological innovation. MacMillan and George [1985] proposed a typology of product/market innovations that one should expect from ICV, and Roberts & Berry [1985] looked at the appropriateness of strategies given the firm's "familiarity" with marketing and technological aspects of the product; however, there has not been a large scale empirical study centering on commercialized products for which venture groups were actually responsible. Moreover, there has not been a study contrasting venture group products with those of other organizations.

The literature on technological innovation intensity versus firm size contains many large-scale studies indicating, among other findings, that R&D is more efficient in small firms; however none of them distinguish the nature of the innovations being generated (see for example, Gellman Research Associates, 1982; and Edwards & Gordon, 1984), nor do they distinguish corporate venturing efforts. A study by Ettlie and Rubenstein [1987] looks at product radicalness versus firm size; however,

here as well, there is no reference to corporate venturing activities.

This study has related technological innovation and organizational factors to three forms of internal corporate venturing. The use of mainstream divisions' and independent small firms' product and organizational characteristics provided a meaningful context within which to view the contributions and characteristics of ICV.

The research was conducted using structured telephone interviews of each organization, followed up with a mail questionnaire. The focal point of the questionnaire was the organization's most recently commercialized product. The perceptual data were subjected to factor and coefficient alpha analyses in order to help define the constructs, and to enhance the reliability of the responses. The constructs, or factors, formed the basis for data analyses that revealed strategic technology-related characteristics for the ICV, MDIV, and SF samples.

We begin with a review of the major findings contrasting the major groups, followed by those for the ICV sub-groups. We look at the implications for theory development and future research as we proceed.

\* \* \* \* \*

We found that the venture groups surveyed generated products that were more radical (PRODRAD) and represented a greater degree of marketing diversification (MKTGDIVR) for the firm than did those generated by mainstream divisions and small firms. Technological diversification (TECHDIVR) was not significantly different among the venture groups, mainstream divisions, and the small firms. Also, the differences in the PRODRAD and MKTGDIVR factors among the mainstream divisions and small firms appears to be insignificant. Apparently, once established, small firms are no more innovative than mainstream organizations in very large firms — though probably for different reasons. As alluded to in our earlier discussion, Miller's research highlighted the notion that "... in Simple firms the entrepreneurial task usually falls upon one person, his knowledge of the environment, that is, of customer wants, sources of supply, and competitor strategies, will provide the information necessary for an aggressive competitive strategy" [1983:783]. On the other hand very large organizations are bound within technical systems designed to promote efficiency at the expense of flexibility (see for example, Mintzberg, 1979).

These results, when viewed within a framework, provide some basis for theory development — a theory being some generalization specifying the relationship between factors

[Miner, 1982]. By having viewed ICV within the meaningful context of other organization types, we are able to propose such generalizations, albeit ones that certainly invite further research.

Placing ICV, MDIV, and SF efforts on a two-dimensional scale defined by PRODRAD and MKTGDIVR — see figure 1 — leads us to speculate on the relative positioning of other new venture strategies, in particular joint venturing. It is especially useful to do so using TECHDIVR as a third dimension, given the

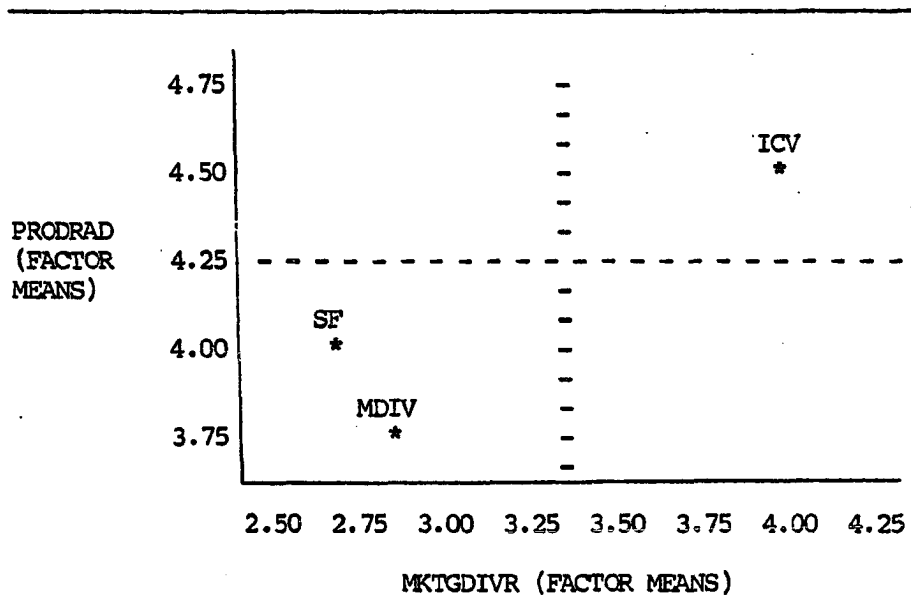


FIGURE 1 — The Major Factors Separating the ICV, MDIV, and SF Groups

---

importance of this type of diversification in such companies as Exxon (Sykes, 1986), and in corporate venturing in general (Roberts & Berry, 1985). (Recall from our earlier discussions that PRODRAD may or may not be associated with TECHDIVR.)

Focusing on joint venturing, Roberts & Berry [1988] identify it as a strategy where technical and/or marketing diversification will likely be high. For example, Berg et al. [1982] found that joint ventures were useful for technological development in the chemicals and computer industries, where R&D is likely to be an entry barrier; and Harrigan [1985] saw it as a strategy for entry into new markets for the firm, and as a "technological change agent" — i.e., a facilitator of technology transfer.

If indeed TECHDIVR is not associated with successful ICV, as our study and some literature (see for example, Sykes, 1986) suggest, and we assume that joint venturing is significantly successful for ventures involving relatively high TECHDIVR and/or MKTGDIVR, as suggested by Roberts & Berry [1988], then we could place joint venturing in three of the quadrants in the three-dimensional model proposed in figure 2; thereby distinguishing it from ICV, as well as from MDIVs and SFs. For added coherence, the inclusion of strategies could be based on a minimum score on the SUCCESS factor.

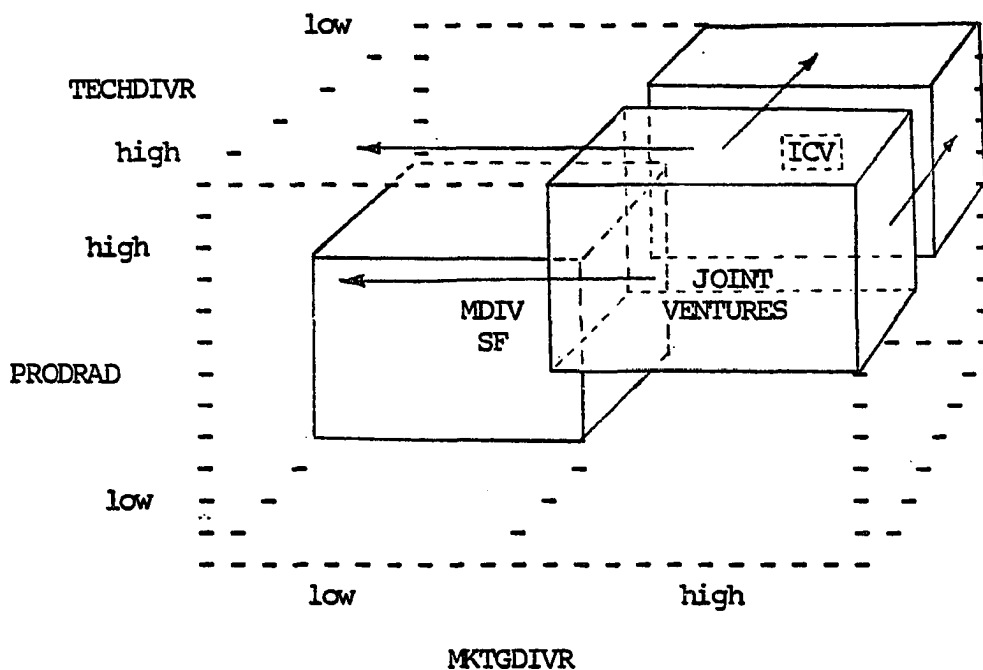


FIGURE 2 — A Three-Dimensional Model Contrasting New Venture Strategies with Mainstream Divisions and Independent Small Firms

---

To further develop the proposed model, future research is needed which compares poor and good performers on a uniform scale. Also, the integrity of the TECHDIVR scale needs to be tested where there are groups whose technical diversification differs significantly.

\* \* \* \* \*

Focusing now on the results that characterize the ICV sub-groups, we first summarize the findings (see table 1), and then propose a framework for their integration.

It was found that product concepts originate from at least three major sources: R&D; an intrapreneur; or the person who eventually plays the role of venture manager, and may initially be known as the intrapreneur. The existence of an intrapreneur appears to lead to greater success for the venture's product. This may be due to the self-motivating nature of the intrapreneur (see Pinchot, 1987), whereas the venture manager is often someone who is assigned (see MacMillan & George, 1985).

---

TABLE 1 -- ICV Sub-Groups versus Significant Differences in Factor Means\*\*\*

---

ICV Group	SUCCESS	PRODPERF	MKTGDIVR	TECHDIVR	PROCDIFF	INTGRATN
A: No Intrapreneur	low	low	low[2]	high	high	low
B: Intrapreneur-Venture Manager	high	+	low	+	+	low
C: Intrapreneur & Venture Manager are Different	high[1]	high	high	low	low	high

---

\*\*\* two-tailed t-test results:  $p < .05$ , except where otherwise noted.

[1] marginally significant with respect to A. T-test result:  $p < .05$

[2] marginally significant with respect to C. T-test result:  $p < .05$   
+ no significant results

---

These findings are consistent with those of Roberts [1988], George and MacMillan [1985], and others, who found that the existence of a champion is crucial to the success of new ventures. Also, the high association of MKTGDIVR with the existence of an intrapreneur may explain the higher success score for the corresponding groups -- if we can assume that greater MKTGDIVR means a generally appreciable marketing orientation, and in turn closer attention to customer needs. (Kotler [1984] and Cooper [1983], among others, have shown that a marketing orientation is the most important success factor.)

Recall that in the cases where the intrapreneur did not become the venture manager versus cases where there was no intrapreneur, product performance (PRODPERF) was significantly higher, and TECHDIVR and procedural differentiation (PROCDIFF) significantly lower for the intrapreneurial organization. Here we speculated that the intrapreneur, being fearful of not getting top management support, tends to stick close to the firm's core technology, and the venture manager is more likely to adhere to established procedures -- hence the high product performance (PRODPERF). Bart [1988], citing the IBM PC experience emphasized that the ability to transfer skills was crucial, and that this was more likely to happen with diversification that is technologically related. Also, the American Express Company,

among others, found that sticking "close to the knitting" is the best way to diversify (Peters & Waterman, 1982).

These conclusions are in accordance with those of von Hippel's [1978] study — i.e., that attention to customer needs and low technological diversification are most important for success.

\* \* \* \*

It appears then, that a champion who is responsible for the product concept, and who focuses more on marketing than technology, may have the qualities that most ensure success. These findings warrant a closer look at the characteristics of the various types of champions.

MacMillan & George [1985] suggested that an effective champion should have a strong orientation towards output instead of analysis; and with respect to the superior performance of the independent start-ups over the corporate start-ups studied by Weiss , "... the individually launched business places greater emphasis on ends rather than means ..." [1981:51] — i.e., a high goal orientation. Also, our findings that the existence of a venture manager who is different than the intrapreneur implies a closer orientation to the firms existing procedures is consistent with the finding that venture managers are assigned — a policy

suggesting a process rather than a goal orientation (see MacMillan & George, 1985; David & Chanin, 1989). Additionally we found that in venture efforts where the intrapreneur and venture manager were different individuals, there was: a) a greater degree of MKTGDIVR and organizational integration (INTGRATN); and b) PRODRAD that was especially high compared to mainstream divisions and small firms. It would appear that intrapreneurs, who may not generally make good venture managers, are the boldest in terms of new product concepts.

It appears then that there are probably various levels of required championing (or goal versus process orientation), depending on the nature and level of diversification the product development process implies. Roberts [1988] defines championing as the advocacy for change and innovation, and the taking of ideas and attempts to get them supported or adopted. On this basis we speculate that generally, as product development proceeds, and venture managers are more likely to be assigned to "champion" the effort, the required championing intensity on the part of the individual champion probably decreases. In other words, once the product concept is adopted, there is proportionately less championing of the product needed than the following of procedures for the product's efficient development -- a notion that bears further investigation.



We have taken a modest step in differentiating the roles of those at the intrapreneur/venture manager level. Needless to say, we need to more comprehensively define the elements of effective "championing", and link them to the product development process before we can arrive at a useful set of personality and environmental predictors for these roles.

\* \* \* \* \*

Finally, recall that six out of the seven products whose commercialization took place in spin-off organizations were developed by venture groups whose intrapreneurs and venture managers were different individuals. Also, these products represented a relatively high degree of technological and marketing diversification. Figure 4 illustrates these outcomes, and it is seen that group C is associated with the broadest range of diversification (DIVERSIF).

Clearly we need to further investigate the decision criteria for creating spin-offs versus commercializing in other types of organizations. There are undoubtedly a number of contingency factors predicting this occurrence. The concept of strategic significance (STRATSIG), a "factor" suggested by Burgelman & Maidique [1988] as partially predicting the commercialization location of a product, needs to be further developed and operationalized. Finally, the application of a



compels researchers to delve more deeply into the implications of all new venture strategies.

By having a more complete picture of product innovation strategies' implications, corporate boards and strategic planners will be in a better position to create conditions that would be conducive to desired strategies. For example, given the common occurrence of spin-offs in high technology industries (Steiner et al., 1986), it would be useful to know more about the contingency factors predicting their success; and the nature of the associated products vis-a-vis those of other strategies', and of independent small firms. Also, government policymakers could make more informed decisions regarding the encouragement of one form of business over another on the basis of the organizations' expected innovation contributions — for example, the support of small firms versus large firms with respect to procurement and credit policies. Once highly developed, the empirical models presented here can be useful in such predictive modes.

#### Recommendations for Future Research

In addition to the specific research already suggested, this study can be extended in a number of other directions.

As we have strongly implied above, one extension could be a large scale comparative study of product innovations generated by

various new venture strategies. Also, for a broader perspective than the one presented here, this should include independent small firms which are start-ups; and, as a separate group, venture capital backed start-ups. (Interestingly, Weiss' [1981] findings suggest that venture capital backed start-ups achieve their financial and market objectives more quickly than corporate start-ups.)

Another useful effort would be an in-depth study of the relationships of intrapreneurs and venture managers, and the decision criteria for their use. This would help us to understand the origins and migration of product concepts, and shed light on the relative championing efforts required for success. Based on the findings discussed above, this type of research is likely to especially enhance our ability to predict spin-offs.

Finally, it would be useful to repeat this study, with the extensions mentioned, using good and poor performing products from each organization surveyed. This would allow the relating of venture success to a number of factors, thereby making the research more appealing.

\* \* \* \* \*

APPENDIX A

Reproductions of the Survey Mailing Material

333 Jay Street, Brooklyn, New York 11201 718-260-3600/FAX 7182603136

DIVISION OF MANAGEMENT

SAMPLE  
COVER LETTER

**Polytechnic**  
UNIVERSITY

Mr. ~~William~~ Vice President, Corporate Business Development  
~~in~~ Corporation  
~~in~~ Road  
~~in~~ Massachusetts ~~in~~

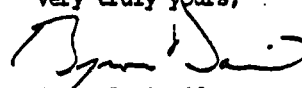
July 5, 1989

Dear Mr. ~~William~~,

Thank you for taking the time to chat with me, and for agreeing to fill in our questionnaire — which is enclosed. Also included is a brief description of the research and a self-addressed stamped envelope.

As I mentioned over the telephone, the information you provide will be treated confidentially; and it will not be possible to identify your firm through any publications based on this research. Please do not hesitate to call me (718.260.3436) if you have any questions about the research, or the questionnaire.

Very truly yours,



Byron L. David  
Assistant Professor

New York City:  
333 Jay Street  
Brooklyn, NY 11201  
718-260-3600  
FAX 7182603136

Long Island:  
Route 110  
Farmingdale, NY 11735  
516-755-4400  
FAX 5167554404

Westchester:  
36 Saw Mill River Road  
Hawthorne, NY 10532  
914-347-6940  
FAX 9143478939

## A BRIEF NOTE ON THIS RESEARCH

Internal Corporate Venturing Strategies are intended to help very large firms become more product-innovative. By reproducing what are believed to be some of the key conditions found in small (entrepreneurial) firms, large firms hope -- through the retention and cultivation of key employees -- to generate products that will help to insure their diversification and growth.

This research seeks to characterize the product innovations generated by new business venture units -- or some forms of venture groups -- within large firms, and to describe the organizational dynamics associated with these units. These innovations will be contrasted with those developed by the large firms' mainstream activities, as well as with those of small firms. It is expected that strategic relationships among product, organizational, and environmental variables will be found.

The results of this research should be of particular interest to corporate planners and policymakers, among others. You may request an executive summary of the completed research by checking the appropriate space in the questionnaire.

Byron L. David  
June 1989

QUESTIONNAIRE FOR FIRMS KNOWN TO BE EMPLOYING  
SOME FORM OF INTERNAL CORPORATE VENTURING

Please answer the following questions as indicated:

BACKGROUND INFORMATION (fill in)

Company Name: \_\_\_\_\_

Mainstream Firm's  
Principal Product Line: \_\_\_\_\_

Internal Venture Group's  
Most Recently  
Commercialized Product: \_\_\_\_\_

Date this product was commercialized (mo./yr.): \_\_\_\_\_

How long have you been associated with this product? \_\_\_\_\_ yrs.

Your Name and Title: \_\_\_\_\_

Your Telephone No: (\_\_\_\_) \_\_\_\_\_

Was the "Venture Manager" -- i.e., the person whose primary function was to oversee the development of mainly this product -- someone other than yourself? YES \_\_\_ NO \_\_\_

Could anyone associated with this product have been characterized as an "Intrapreneur"? (An Intrapreneur is someone who conceives a product pretty much on his/her own, and develops it to the point where it might draw support from other individuals and/or departments in the mainstream organization.) YES \_\_\_ NO \_\_\_

If YES, were the Intrapreneur and Venture Manager the same person? Y \_\_\_ N \_\_\_

If NO, which group or individual (by title) was most responsible for the product concept? (please write in) \_\_\_\_\_

Would you like an Executive Summary of the completed research? YES \_\_\_ NO \_\_\_

continued:

The remaining sections pertain first to the product attributes of the Internal Venture Group's Most Recently Commercialized Product, and then to the organizational and environmental characteristics associated with this product.

Answer by simply circling the appropriate digit, unless otherwise indicated.

**PRODUCT ATTRIBUTES**

	not at all	to a very small extent	to a small extent	to a significant extent	to a great extent	to a very great extent	totally
Product effort paved the way for future efforts	1	2	3	4	5	6	7
Return on investment projections look promising	1	2	3	4	5	6	7
Market share growth rate looks promising	1	2	3	4	5	6	7
<b>At the time of commercialization:</b>							
Product met its originally targeted technical specifications	1	2	3	4	5	6	7
Product concept and market were a good match	1	2	3	4	5	6	7
Product technology was new to the industry	1	2	3	4	5	6	7
Process technology for this product was new to the industry	1	2	3	4	5	6	7
Functionally equivalent products existed in the marketplace	1	2	3	4	5	6	7

continued:

The product and its market can best be characterized as (check one):

Basically Existing Product*	Basically Existing Product	Improved Product***	Improved Product	New Product****	New Product
Existing** Market	New Market	Existing Market	New Market	Existing Market	New Market
_____	_____	_____	_____	_____	_____

\* A "Basically Existing Product" would be one with a cosmetic or style change.

\*\* Existing Markets are those the firm already serves.

\*\*\* An "Improved Product" would have new performance features and/or greater reliability than earlier versions of this product.

\*\*\*\* A "New Product" would be one that meets a need in a unique way -- for eg., the first television, interactive prose on diskettes, "Post-Its", etc.

#### DIVERSIFICATION REPRESENTED BY THE PRODUCT

	not at all	to a very small extent	to a small extent	to a significant extent	to a great extent	to a very great extent	totally
Maximal technical skills transfer was possible	1	2	3	4	5	6	7
New promotional skills were adopted	1	2	3	4	5	6	7
Top management commitment was easily secured	1	2	3	4	5	6	7
New distribution channels adopted	1	2	3	4	5	6	7
Source of process technology was internal	1	2	3	4	5	6	7
Source of product technology was internal	1	2	3	4	5	6	7
Expected product life-cycle similar to mainstream products'	1	2	3	4	5	6	7

continued:

## VENTURE MANAGER'S ORIENTATION

	not at all	to a very small extent	to a small extent	to a significant extent	to a great extent	to a very great extent	totally
The venture manager:							
Took analytical approaches to most situations	1	2	3	4	5	6	7
Believed that goal definition resided in the minds of others	1	2	3	4	5	6	7
Was concerned with rules and procedural matters	1	2	3	4	5	6	7
Was concerned with the future availability of resources	1	2	3	4	5	6	7

## ORGANIZATIONAL DIFFERENTIATION — between the venture group and the mainstream organization.

Venture group was a separate cost center	1	2	3	4	5	6	7
Venture group adhered to mainstream policies	1	2	3	4	5	6	7
Venture group shared R&D people with the mainstream organization	1	2	3	4	5	6	7
Venture group shared marketing people with the mainstream organization	1	2	3	4	5	6	7
Venture group shared finance people with the mainstream organization	1	2	3	4	5	6	7

continued:

	not at all	to a very small extent	to a small extent	to a significant extent	to a great extent	to a very great extent	totally
Location of venture group was within the mainstream organization	1	2	3	4	5	6	7
Venture group had the same reward system as the mainstream employees	1	2	3	4	5	6	7

#### INTEGRATION OF VENTURE AND MAINSTREAM ORGANIZATIONS

To what extent were the following integrative mechanisms used between the mainstream organization and the venture group?

	not at all	to a very small extent	to a small extent	to a significant extent	to a great extent	to a very great extent	all the time
Interdepartmental committees	1	2	3	4	5	6	7
Liaison people	1	2	3	4	5	6	7
Task forces	1	2	3	4	5	6	7
Regular meetings	1	2	3	4	5	6	7

#### VENTURE PRODUCT'S INDUSTRY ENVIRONMENT

	not at all	to a very small extent	to a small extent	to a significant extent	to a great extent	to a very great extent	extremely so
In this venture product's industry:							
Marketing practices change frequently	1	2	3	4	5	6	7
Product obsolescence rate is high	1	2	3	4	5	6	7

continued:

	not at all	to a very small extent	to a small extent	to a significant extent	to a great extent	to a very great extent	extremely so
Actions of competitors are difficult to predict	1	2	3	4	5	6	7
Forecasting customer demand is difficult	1	2	3	4	5	6	7
Modes of production are frequently changed	1	2	3	4	5	6	7

**THE VENTURE ORGANIZATION** (These questions pertain to the venture group you have been referring to all along.)

Please fill in the blanks:

1. No. of years in existence: \_\_\_\_\_ yrs.
2. Original no. of employees (approx.): \_\_\_\_\_ employees.
3. Present no. of employees (approx.): \_\_\_\_\_ employees.
4. No. of product innovations commercialized since organization's inception (approx.): \_\_\_\_\_ products.
5. Source(s) of funding: internal, bank loans, intercorporate (joint venture), venture capital, etc., please specify: \_\_\_\_\_.

**LOCATION OF PRODUCT INNOVATION**

Long-term commercialization will most likely be taking place in:

The Venture Group: \_\_\_\_\_, A New Division: \_\_\_\_\_, A Spinoff Company: \_\_\_\_\_,

The Mainstream Firm: \_\_\_\_\_, OR

Another Organization (please specify): \_\_\_\_\_.

THANK YOU SO MUCH

Byron L. David

#### A BRIEF NOTE ON THIS RESEARCH

This research seeks to characterize the product innovations generated by new business venture units within large firms, and to describe the organizational dynamics associated with these units. For added depth, these innovations will be contrasted with those generated by the firms' mainstream activities — hence the attached "Mainstream Division" questionnaire — as well as with those of small firms. It is expected that strategic relationships between product, organizational, and environmental variables will be found.

The results, which we look forward to seeing published in one of the leading management journals, should be of particular interest to corporate planners and policymakers, among others. You can request an executive summary of the completed research by checking the designated space on the questionnaire.

Thank you for participating.

Byron L. David  
June 1989

## QUESTIONNAIRE FOR MAINSTREAM DIVISIONS

Please answer the following questions as indicated:

## BACKGROUND INFORMATION (fill in)

Company Name: \_\_\_\_\_

Division's Name: \_\_\_\_\_

Your Name and Title: \_\_\_\_\_

Your Telephone No: (\_\_\_\_) \_\_\_\_\_

Present no. of employees (approx.): \_\_\_\_\_ employees.

Principal Product Line: \_\_\_\_\_

No. of products commercialized  
since division was founded (approx.): 1\_\_ 2-4\_\_ 5-10\_\_ 11-22\_\_ >22\_\_

Most Recently Commercialized Product Due Mainly to the Mainstream Efforts  
of this division: \_\_\_\_\_

Date this Product was Commercialized (mo./yr.): \_\_\_\_\_

Source(s) of Funding for this Product:

internal, bank loans, intercorporate (joint venture),

venture capital, etc., please specify: \_\_\_\_\_

Would you like an Executive Summary of the completed research? \_\_\_\_\_

continued:

The remaining sections pertain first to the product attributes associated with the divisions's most recently commercialized product; and then to the division's organizational and environmental characteristics.

Answer by simply circling the appropriate digit, unless otherwise noted.

**PRODUCT ATTRIBUTES**

	not at all	to a very small extent	to a small extent	to a significant extent	to a great extent	to a very great extent	totally
Product effort paved the way for future efforts	1	2	3	4	5	6	7
Return on investment projections look promising	1	2	3	4	5	6	7
Market share growth rate looks promising	1	2	3	4	5	6	7
At the time of commercialization:							
Product met its originally targeted technical specifications	1	2	3	4	5	6	7
Product concept and market were a good match	1	2	3	4	5	6	7
Product technology was new to the industry	1	2	3	4	5	6	7
Process technology for this product was new to the industry	1	2	3	4	5	6	7
Functionally equivalent products existed in the marketplace	1	2	3	4	5	6	7

continued:

The product and its market can best be characterized as (check one):

Basically Existing Product*	Basically Existing Product	Improved Product***	Improved Product	New Product****	New Product
Existing** Market	New Market	Existing Market	New Market	Existing Market	New Market
_____	_____	_____	_____	_____	_____

\* A "Basically Existing Product" would be one with a cosmetic or style change.

\*\* Existing Markets are those the firm already serves.

\*\*\* An "Improved Product" would have new performance features and/or greater reliability than earlier versions of this product.

\*\*\*\* A "New Product" would be one that meets a need in a unique way -- for eg., the first television, interactive prose on diskettes, "Post-Its", etc.

#### DIVERSIFICATION REPRESENTED BY THE PRODUCT

	not at all	to a very small extent	to a small extent	to a significant extent	to a great extent	to a very great extent	totally
New technical skills were adopted	1	2	3	4	5	6	7
New promotional skills were adopted	1	2	3	4	5	6	7
Top management commitment was easily secured	1	2	3	4	5	6	7
New distribution channels adopted	1	2	3	4	5	6	7
Source of process technology was internal	1	2	3	4	5	6	7
Source of product technology was internal	1	2	3	4	5	6	7
Expected product life-cycle similar to mainstream products'	1	2	3	4	5	6	7

continued:

## PRODUCT'S INDUSTRY ENVIRONMENT

	not at all	to a very small extent	to a small extent	to a significant extent	to a great extent	to a very great extent	extremely so
Marketing practices need to be changed frequently	1	2	3	4	5	6	7
Product obsolescence rate is high in this industry	1	2	3	4	5	6	7
Actions of competitors are difficult to predict	1	2	3	4	5	6	7
Forecasting customer demand is difficult	1	2	3	4	5	6	7
Modes of production in this industry often change	1	2	3	4	5	6	7

## LOCATION OF PRODUCT INNOVATION

Long-term commercialization will most likely be taking place in:

A New Division:\_\_\_\_, A Spinoff Company:\_\_\_\_, The Mainstream Firm:\_\_\_\_, OR

Another Organization (please specify):\_\_\_\_\_.

THANK YOU SO MUCH

Byron L. David

#### A BRIEF NOTE ON THIS RESEARCH

This research seeks to characterize the product innovations generated by new business units within large firms, and to contrast them with those generated by small firms -- hence this questionnaire. Also, it is expected that strategic relationships between product and environmental characteristics will be found for each group.

The results, which we look forward to seeing published in one of the leading management journals, should be of particular interest to corporate planners and policymakers, small business owners, and the small business administration, among others. You can request an executive summary of the completed research by checking the designated space on the questionnaire.

Thank you for your interest.

Byron L. David  
July 1989

## QUESTIONNAIRE FOR SMALL FIRMS

Please answer the following questions as indicated:

## BACKGROUND INFORMATION (fill in)

Company Name: \_\_\_\_\_

Your Name and Title: \_\_\_\_\_

Your Telephone No: (\_\_\_\_) \_\_\_\_\_

No. of years firm in existence: \_\_\_\_\_ yrs.

Original no. of employees (approx.): \_\_\_\_\_ employees.

Present no. of employees (approx.): \_\_\_\_\_ employees.

Principal Product: \_\_\_\_\_

No. of products commercialized

since firm was founded (approx.): 1 \_\_\_ 2-4 \_\_\_ 5-10 \_\_\_ 11-22 \_\_\_ >22 \_\_\_

Most Recently  
Commercialized Product: \_\_\_\_\_

Date this product was commercialized (mo./yr.): \_\_\_\_\_

Source(s) of funding for the Most Recently Commercialized Product:

internal, bank loans, intercorporate (joint venture),  
venture capital, etc., please specify: \_\_\_\_\_.

Would you like an Executive Summary of the completed research? \_\_\_\_\_

continued:

The remaining sections pertain first to the product attributes associated with the firm's most recently commercialized product; and then to the firm's organizational and environmental characteristics.

Answer by simply circling the appropriate digit, unless otherwise noted.

**PRODUCT ATTRIBUTES**

	not at all	to a very small extent	to a small extent	to a significant extent	to a great extent	to a very great extent	totally
Product effort paved the way for future efforts	1	2	3	4	5	6	7
Return on investment projections look promising	1	2	3	4	5	6	7
Market share growth rate looks promising	1	2	3	4	5	6	7
At the time of commercialization:							
Product met its originally targeted technical specifications	1	2	3	4	5	6	7
Product concept and market were a good match	1	2	3	4	5	6	7
Product technology was new to the industry	1	2	3	4	5	6	7
Process technology for this product was new to the industry	1	2	3	4	5	6	7
Functionally equivalent products existed in the marketplace	1	2	3	4	5	6	7

continued:

The product and its market can best be characterized as (check one):

Basically Existing Product*	Basically Existing Product	Improved Product***	Improved Product	New Product****	New Product
Existing**	New	Existing	New	Existing	New
Market	Market	Market	Market	Market	Market

\* A "Basically Existing Product" would be one with a cosmetic or style change.

\*\* Existing Markets are those the firm already serves.

\*\*\* An "Improved Product" would have new performance features and/or greater reliability than earlier versions of this product.

\*\*\*\* A "New Product" would be one that meets a need in a unique way — for eg., the first television, interactive prose on diskettes, "Post-Its", etc.

#### DIVERSIFICATION REPRESENTED BY THE PRODUCT

	not at all	to a very small extent	to a small extent	to a significant extent	to a great extent	to a very great extent	totally
New technical skills were adopted	1	2	3	4	5	6	7
New promotional skills were adopted	1	2	3	4	5	6	7
Top management commitment was easily secured	1	2	3	4	5	6	7
New distribution channels adopted	1	2	3	4	5	6	7
Source of process technology was internal	1	2	3	4	5	6	7
Source of product technology was internal	1	2	3	4	5	6	7
Expected product life-cycle similar to mainstream products'	1	2	3	4	5	6	7

continued:

## PRODUCT'S INDUSTRY ENVIRONMENT

	not at all	to a very small extent	to a small extent	to a significant extent	to a great extent	to a very great extent	extremely so
Marketing practices need to be changed frequently	1	2	3	4	5	6	7
Product obsolescence rate is high in this industry	1	2	3	4	5	6	7
Actions of competitors are difficult to predict	1	2	3	4	5	6	7
Forecasting customer demand is difficult	1	2	3	4	5	6	7
Modes of production in this industry often change	1	2	3	4	5	6	7

## LOCATION OF PRODUCT INNOVATION

Long-term commercialization will most likely be taking place in:

A New Division: \_\_\_\_\_, A Spinoff Company: \_\_\_\_\_, The Mainstream Firm: \_\_\_\_\_, OR

Another Organization (please specify): \_\_\_\_\_.

THANK YOU SO MUCH

Byron L. David

**APPENDIX B**

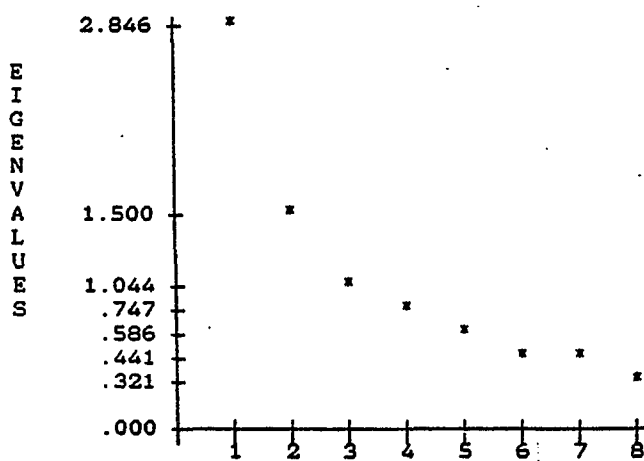
**Factor Analyses**

- - - - FACTOR ANALYSIS - - - -

Final Statistics:

Variable	Communality	*
V1	.67356	*
V2	.69034	*
V3	.75491	*
V4	.80963	*
V5	.67932	*
V6	.69292	*
V7	.50502	*
V8	.58361	*

Factor	Eigenvalue	Pct of Var	Cum Pct
1	2.84568	35.6	35.6
2	1.49960	18.7	54.3
3	1.04404	13.1	67.4



PC Extracted 3 factors.

## Varimax

## Rotated Factor Matrix:

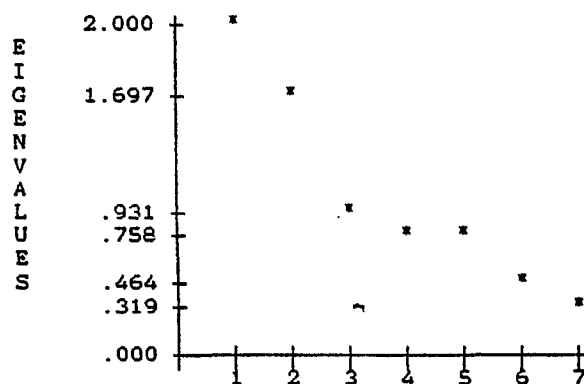
	FACTOR 1	FACTOR 2	FACTOR 3
V1	.78495	.21515	-.10544
V2	.66912	.01726	.49226
V3	.82230	.16481	.22711
V4	-.06486	.12444	.88878
V5	.37479	-.01421	.73393
V6	.23683	.79260	.09281
V7	.15490	.69346	.01195
V8	-.01546	.76297	.03530

## - - - - FACTOR ANALYSIS - -

## Final Statistics:

Variable	Communality	*
V9	.15762	*
V10	.69047	*
V11	.34246	*
V12	.68832	*
V13	.64344	*
V14	.74784	*
V15	.42720	*

Factor	Eigenvalue	Pct of Var	Cum Pct
1	2.00043	28.6	28.6
2	1.69691	24.2	52.8



PC Extracted 2 factors.

#### Varimax

#### Rotated Factor Matrix:

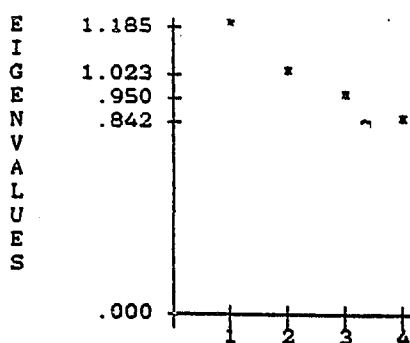
	FACTOR 1	FACTOR 2
V9	-.31996	.23505
V10	.83087	-.01125
V11	.42213	.40530
V12	.82662	-.07089
V13	-.06256	.79971
V14	-.06004	.86269
V15	.50493	.41502

#### --- FACTOR ANALYSIS ---

#### Final Statistics:

Variable	Communality	*
V16	.56198	*
V17	.59782	*
V18	.51158	*
V19	.53656	*

Factor	Eigenvalue	Pct of Var	Cum Pct
1	1.18505	29.6	29.6
2	1.02289	25.6	55.2



PC Extracted 2 factors.

Varimax .

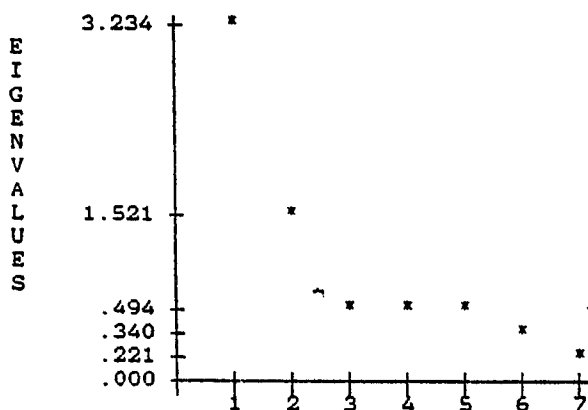
Rotated Factor Matrix:

	FACTOR 1	FACTOR 2
V16	.30111	.68652
V17	-.28907	.71712
V18	.70217	.13614
V19	.71950	-.13739

- - - - FACTOR ANALYSIS -

Final Statistics:

Variable	Communality	*
V20	.68625	*
V21	.64259	*
V22	.56338	*
V23	.83037	*
V24	.67562	*
V25	.66200	*
V26	.69467	*



PC Extracted 2 factors.

Factor	Eigenvalue	Pct of Var	Cum Pct
1	3.23381	46.2	46.2
2	1.52106	21.7	67.9

Varimax

Rotated Factor Matrix:

	FACTOR 1	FACTOR 2
V20	.17938	.80875
V21	.78608	-.15704
V22	.52228	.53908
V23	-.09950	.90580
V24	.70307	.42581
V25	.71094	.39567
V26	.83290	.03087

--- FACTOR ANALYSIS ---

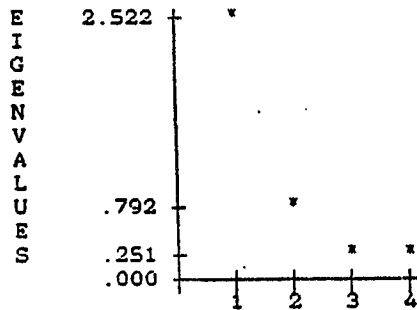
Factor Matrix:

	FACTOR 1
V27	.84559
V28	.64854
V29	.84783
V30	.81708

Final Statistics:

Variable	Communality
V27	.71502
V28	.42061
V29	.71882
V30	.66763

Factor	Eigenvalue	Pct of Var	Cum Pct
1	2.52208	63.1	63.1



PC Extracted 1 factors.

--- FACTOR ANALYSIS ---

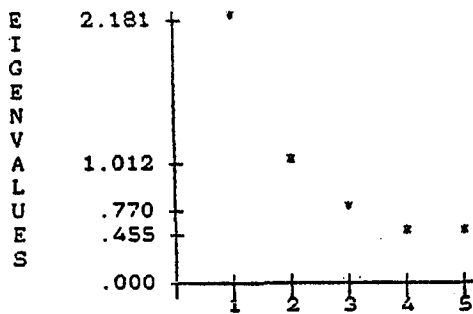
Factor Matrix:

	FACTOR 1
V31	.64464
V32	.63055
V33	.61998
V34	.53694
V35	.64047

Final Statistics:

Variable	Communality	*
V31	.41557	*
V32	.39759	*
V33	.38437	*
V34	.28830	*
V35	.41020	*

Factor	Eigenvalue	Pct of Var	Cum Pct
1	1.89603	37.9	37.9



PC Extracted 2 factors.

APPENDIX C

Cronbach's Alpha (Reliability Analysis)

## RELIABILITY ANALYSIS - SCALE (SUCCESS)

## ITEM-TOTAL STATISTICS

	SCALE MEAN IF ITEM DELETED	SCALE VARIANCE IF ITEM DELETED	CORRECTED ITEM- TOTAL CORRELATION	SQUARED MULTIPLE CORRELATION	ALPHA IF ITEM DELETED
V1	9.4138	4.9954	.4552	.2426	.7603
V2	9.2529	5.0571	.5373	.3770	.6585
V3	9.1839	4.3706	.6756	.4724	.4875

## RELIABILITY COEFFICIENTS 3 ITEMS

ALPHA = .7289                      STANDARDIZED ITEM ALPHA = .7318

## RELIABILITY ANALYSIS - SCALE (PRODPERF)

## ITEM-TOTAL STATISTICS

	SCALE MEAN IF ITEM DELETED	SCALE VARIANCE IF ITEM DELETED	CORRECTED ITEM- TOTAL CORRELATION	SQUARED MULTIPLE CORRELATION	ALPHA IF ITEM DELETED
V4	5.0747	1.2256	.4618	.2132	.
V5	5.1609	1.7774	.4618	.2132	.

## RELIABILITY COEFFICIENTS 2 ITEMS

ALPHA = .6244                      STANDARDIZED ITEM ALPHA = .6318

## RELIABILITY ANALYSIS - SCALE (PRODRAD)

## ITEM-TOTAL STATISTICS

	SCALE MEAN IF ITEM DELETED	SCALE VARIANCE IF ITEM DELETED	CORRECTED ITEM- TOTAL CORRELATION	SQUARED MULTIPLE CORRELATION	ALPHA IF ITEM DELETED
V6	8.2299	6.6058	.5569	.3109	.3968
V7	8.9483	7.5060	.4121	.1974	.6098
V8	7.6034	8.4603	.4063	.1986	.6111

## RELIABILITY COEFFICIENTS 3 ITEMS

ALPHA = .6452 STANDARDIZED ITEM ALPHA = .6448

## RELIABILITY ANALYSIS - SCALE (MKTG DIVR)

## ITEM-TOTAL STATISTICS

	SCALE MEAN IF ITEM DELETED	SCALE VARIANCE IF ITEM DELETED	CORRECTED ITEM- TOTAL CORRELATION	SQUARED MULTIPLE CORRELATION	ALPHA IF ITEM DELETED
V10	6.0862	6.8538	.6005	.3901	.3357
V12	6.6609	5.5549	.4968	.3566	.4678
V15	6.2644	8.9239	.2797	.0943	.7315

## RELIABILITY COEFFICIENTS 3 ITEMS

ALPHA = .6338 STANDARDIZED ITEM ALPHA = .6379

## RELIABILITY ANALYSIS - SCALE (TECHDIVR)

## ITEM-TOTAL STATISTICS

	SCALE MEAN IF ITEM DELETED	SCALE VARIANCE IF ITEM DELETED	CORRECTED ITEM- TOTAL CORRELATION	SQUARED MULTIPLE CORRELATION	ALPHA IF ITEM DELETED
V13	2.7529	2.5918	.5654	.3197	.
V14	2.7529	2.4877	.5654	.3197	.

## RELIABILITY COEFFICIENTS 2 ITEMS

ALPHA = .7223                      STANDARDIZED ITEM ALPHA = .7224

## RELIABILITY ANALYSIS - SCALE (GOALDIR)

## ITEM-TOTAL STATISTICS

	SCALE MEAN IF ITEM DELETED	SCALE VARIANCE IF ITEM DELETED	CORRECTED ITEM- TOTAL CORRELATION	SQUARED MULTIPLE CORRELATION	ALPHA IF ITEM DELETED
V16	5.5098	1.6149	.0164	.0003	.
V17	3.6471	1.2729	.0164	.0003	.

## RELIABILITY COEFFICIENTS 2 ITEMS

ALPHA = .0321                      STANDARDIZED ITEM ALPHA = .0323

## RELIABILITY ANALYSIS - SCALE (RSRCDIFF)

## ITEM-TOTAL STATISTICS

	SCALE MEAN IF ITEM DELETED	SCALE VARIANCE IF ITEM DELETED	CORRECTED ITEM- TOTAL CORRELATION	SQUARED MULTIPLE CORRELATION	ALPHA IF ITEM DELETED
V18	3.9804	2.4196	.1503	.0226	.
V19	5.1961	.7608	.1503	.0226	.

## RELIABILITY COEFFICIENTS 2 ITEMS

ALPHA = .2273                      STANDARDIZED ITEM ALPHA = .2613

## RELIABILITY ANALYSIS - SCALE (MKTGDIFF)

## ITEM-TOTAL STATISTICS

	SCALE MEAN IF ITEM DELETED	SCALE VARIANCE IF ITEM DELETED	CORRECTED ITEM- TOTAL CORRELATION	SQUARED MULTIPLE CORRELATION	ALPHA IF ITEM DELETED
V20	9.4706	10.0141	.5804	.3931	.5124
V22	10.4510	12.9325	.3914	.1532	.7500
V23	9.7255	11.8031	.5844	.3881	.5239

## RELIABILITY COEFFICIENTS 3 ITEMS

ALPHA = .6965                      STANDARDIZED ITEM ALPHA = .6990

## RELIABILITY ANALYSIS - SCALE (PROCDIFF)

## ITEM-TOTAL STATISTICS

	SCALE MEAN IF ITEM DELETED	SCALE VARIANCE IF ITEM DELETED	CORRECTED ITEM- TOTAL CORRELATION	SQUARED MULTIPLE CORRELATION	ALPHA IF ITEM DELETED
V21	10.7451	26.4337	.5342	.2879	.7728
V24	11.2941	20.0918	.6135	.3918	.7250
V25	10.6471	19.3129	.6077	.3735	.7320
V26	11.6078	20.4031	.6670	.4485	.6957

## RELIABILITY COEFFICIENTS 4 ITEMS

ALPHA = .7865

STANDARDIZED ITEM ALPHA = .7932

## RELIABILITY ANALYSIS - SCALE (INTGRATN)

## ITEM-TOTAL STATISTICS

	SCALE MEAN IF ITEM DELETED	SCALE VARIANCE IF ITEM DELETED	CORRECTED ITEM- TOTAL CORRELATION	SQUARED MULTIPLE CORRELATION	ALPHA IF ITEM DELETED
V27	9.9608	17.1584	.6764	.5893	.7231
V28	9.3529	21.3129	.4578	.2712	.8231
V29	10.0588	17.6165	.6873	.5739	.7183
V30	9.1569	17.8949	.6551	.4414	.7344

## RELIABILITY COEFFICIENTS 4 ITEMS

ALPHA = .8030

STANDARDIZED ITEM ALPHA = .8006

## ITEM-TOTAL STATISTICS

	SCALE MEAN IF ITEM DELETED	SCALE VARIANCE IF ITEM DELETED	CORRECTED ITEM- TOTAL CORRELATION	SQUARED MULTIPLE CORRELATION	ALPHA IF ITEM DELETED
V27	6.4706	9.4941	.7437	.5880	.6872
V29	6.5686	10.1702	.7177	.5650	.7167
V30	5.6667	11.2667	.5806	.3391	.8500

## RELIABILITY COEFFICIENTS      3 ITEMS

ALPHA = .8231                      STANDARDIZED ITEM ALPHA = .8227

## RELIABILITY ANALYSIS - SCALE (ENV DYNAM)

## ITEM-TOTAL STATISTICS

	SCALE MEAN IF ITEM DELETED	SCALE VARIANCE IF ITEM DELETED	CORRECTED ITEM- TOTAL CORRELATION	SQUARED MULTIPLE CORRELATION	ALPHA IF ITEM DELETED
V31	14.5977	10.3575	.3681	.1458	.5118
V32	13.9483	9.4597	.3417	.1494	.5263
V33	13.9770	9.9301	.3574	.1312	.5152
V34	13.5287	10.1234	.2822	.1020	.5604
V35	14.7299	10.8226	.3657	.1357	.5175

## RELIABILITY COEFFICIENTS      5 ITEMS

ALPHA = .5812                      STANDARDIZED ITEM ALPHA = .5892

## APPENDIX D

T-Tests of the Factor Means Across  
the ICV, MDIV, and SF Groups

## I. Summary of the Factor Means and Their Two-Tailed Probabilities:

Factor	ICV	MDIV	ICV	SF	MDIV	SF
SUCCESS	4.67 (.346)	4.88	4.67 (.762)	4.61	4.88 (.166)	4.61
PRODPERF	5.04 (.162)	5.32	5.04 (.955)	5.03	5.32 (.136)	5.03
PRODRAD	4.54 (.004)*	3.83	4.54 (.027)*	4.06	3.83 (.338)	4.06
MKTGDIVR	4.02 (.000)*	2.82	4.02 (.000)*	2.73	2.82 (.713)	2.73
TECHDIVR	2.79 (.480)	2.59	2.78 (.788)	2.85	2.59 (.320)	2.85
ENV DYNAM	3.53 (.858)	3.56	3.53 (.961)	3.53	3.56 (.804)	3.56

---

\* p-values where the null hypothesis was rejected.  
(p is the probability that a difference at least as large as the one observed would arise if the means were really equal.)

---

## II. The SPSS outputs for the T-Tests begin on the pages that follow:

T-TEST /GROUPS V37 (3,6) /VARIABLES SUCCESS PRODPERF PRODRAD MKTGDIVR TECHDIVR  
ENVVDYNAM.

Independent samples of V37

Group 1: V37 EQ 3                      Group 2: V37 EQ 6

t-test for: SUCCESS

		Number of Cases	Mean	Standard Deviation	Standard Error			
	Group 1	51	4.6667	1.169	.164			
	Group 2	52	4.8846	1.166	.162			
		Pooled Variance Estimate			Separate Variance Estimate			
F	2-Tail	t	Degrees of	2-Tail	t	Degrees of	2-Tail	
Value	Prob.	Value	Freedom	Prob.	Value	Freedom	Prob.	
1.01	.983	-.95	101	.346	-.95	100.95	.346	

Independent samples of V37

Group 1: V37              EQ 3                      Group 2: V37              EQ 6

t-test for: PRODPERF

		Number of Cases	Mean	Standard Deviation	Standard Error			
	Group 1	51	5.0392	1.009	.141			
	Group 2	52	5.3173	.995	.138			
		Pooled Variance Estimate			Separate Variance Estimate			
F	2-Tail	t	Degrees of	2-Tail	t	Degrees of	2-Tail	
Value	Prob.	Value	Freedom	Prob.	Value	Freedom	Prob.	
1.03	.921	-1.41	101	.162	-1.41	100.89	.162	

MORE

## Independent samples of V37

Group 1: V37      EQ 3                      Group 2: V37      EQ 6

t-test for: PRODRAD

		Number of Cases	Mean	Standard Deviation	Standard Error			
Group 1		51	4.5425	1.060	.148			
Group 2		52	3.8269	1.362	.189			
		Pooled Variance Estimate			Separate Variance Estimate			
F Value	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.	
1.65	.079	2.97	101	.004	2.98	96.09	.004	

## Independent samples of V37

Group 1: V37      EQ 3                      Group 2: V37      EQ 6

t-test for: MKTGDIVR

		Number of Cases	Mean	Standard Deviation	Standard Error			
Group 1		51	4.0196	1.439	.201			
Group 2		52	2.8173	1.449	.201			
		Pooled Variance Estimate			Separate Variance Estimate			
F Value	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.	
1.01	.962	4.23	101	.000	4.23	100.98	.000	

MORE

Independent samples of V37

Group 1: V37 EQ 3 Group 2: V37 EQ 6

t-test for: TECHDIVR

		Number of Cases	Mean	Standard Deviation	Standard Error			
Group 1		51	2.7843	1.305	.183			
Group 2		52	2.5865	1.514	.210			
		Pooled Variance Estimate			Separate Variance Estimate			
F Value	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.	
1.35	.295	.71	101	.480	.71	99.37	.479	

MORE

Independent samples of V37

Group 1: V37 EQ 3 Group 2: V37 EQ 6

t-test for: ENVVDYNAM

		Number of Cases	Mean	Standard Deviation	Standard Error			
Group 1		51	3.5333	.753	.105			
Group 2		52	3.5615	.838	.116			
		Pooled Variance Estimate			Separate Variance Estimate			
F Value	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.	
1.24	.451	-.18	101	.858	-.18	100.24	.858	

T-TEST /GROUPS V37 (3,9) /VARIABLES SUCCESS PRODPERF PRODRAD MKTGDIVR TECHDIVR ENVDYNAM.

Independent samples of V37

Group 1: V37 EQ 3                      Group 2: V37 EQ 9

t-test for: SUCCESS

	Number of Cases	Mean	Standard Deviation	Standard Error
Group 1	51	4.6667	1.169	.164
Group 2	71	4.6056	1.042	.124

		Pooled Variance Estimate			Separate Variance Estimate		
F	2-Tail Value Prob.	t	Degrees of Freedom	2-Tail Prob.	t	Degrees of Freedom	2-Tail Prob.
1.26	.370	.30	120	.762	.30	100.05	.767

Independent samples of V37

Group 1: V37 EQ 3                      Group 2: V37 EQ 9

t-test for: PRODPERF

	Number of Cases	Mean	Standard Deviation	Standard Error
Group 1	51	5.0392	1.009	.141
Group 2	71	5.0282	1.098	.130

		Pooled Variance Estimate			Separate Variance Estimate		
F	2-Tail Value Prob.	t	Degrees of Freedom	2-Tail Prob.	t	Degrees of Freedom	2-Tail Prob.
1.18	.531	.06	120	.955	.06	112.90	.954

MORE

Independent samples of V37

Group 1: V37      EQ 3                      Group 2: V37      EQ 9

t-test for: PRODRAD

	Number of Cases	Mean	Standard Deviation	Standard Error
Group 1	51	4.5425	1.060	.148
Group 2	71	4.0563	1.264	.150

		Pooled Variance Estimate			Separate Variance Estimate		
F	2-Tail Value Prob.	t	Degrees of Freedom	2-Tail Prob.	t	Degrees of Freedom	2-Tail Prob.
1.42	.192	2.24	120	.027	2.30	117.05	.023

Independent samples of V37

Group 1: V37      EQ 3                      Group 2: V37      EQ 9

t-test for: MKTGDIVR

	Number of Cases	Mean	Standard Deviation	Standard Error
Group 1	51	4.0196	1.439	.201
Group 2	71	2.7254	1.301	.154

		Pooled Variance Estimate			Separate Variance Estimate		
F	2-Tail Value Prob.	t	Degrees of Freedom	2-Tail Prob.	t	Degrees of Freedom	2-Tail Prob.
1.22	.432	5.19	120	.000	5.10	101.06	.000

MORE

Independent samples of V37

Group 1: V37      EQ 3                      Group 2: V37      EQ 9

t-test for: TECHDIVR

		Number of Cases	Mean	Standard Deviation	Standard Error			
Group 1		51	2.7843	1.305	.183			
Group 2		71	2.8521	1.413	.168			
		Pooled Variance Estimate			Separate Variance Estimate			
F Value	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.	
1.17	.558	-.27	120	.788	-.27	112.62	.785	

Independent samples of V37

Group 1: V37      EQ 3                      Group 2: V37      EQ 9

t-test for: ENVDYNAM

		Number of Cases	Mean	Standard Deviation	Standard Error			
Group 1		51	3.5333	.753	.105			
Group 2		71	3.5268	.707	.084			
		Pooled Variance Estimate			Separate Variance Estimate			
F Value	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.	
1.14	.617	.05	120	.961	.05	103.64	.961	

MORE

T-TEST /GROUPS V37 (6,9) /VARIABLES SUCCESS PRODPERF PRODRAD MKTGDIVR TECHDIVR ENVVDYNAM.

Independent samples of V37

Group 1: V37 EQ 6                      Group 2: V37 EQ 9

t-test for: SUCCESS

	Number of Cases	Mean	Standard Deviation	Standard Error
Group 1	52	4.8846	1.166	.162
Group 2	71	4.6056	1.042	.124

		Pooled Variance Estimate			Separate Variance Estimate		
F Value	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.
1.25	.380	1.39	121	.166	1.37	102.54	.173

Independent samples of V37

Group 1: V37 EQ 6                      Group 2: V37 EQ 9

t-test for: PRODPERF

	Number of Cases	Mean	Standard Deviation	Standard Error
Group 1	52	5.3173	.995	.138
Group 2	71	5.0282	1.098	.130

		Pooled Variance Estimate			Separate Variance Estimate		
F Value	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.
1.22	.462	1.50	121	.136	1.52	115.57	.130

MORE

Independent samples of V37

Group 1: V37      EQ 6                      Group 2: V37      EQ 9

t-test for: PRODRAD

	Number of Cases	Mean	Standard Deviation	Standard Error
Group 1	52	3.8269	1.362	.189
Group 2	71	4.0563	1.264	.150

F Value	2-Tail Prob.	Pooled Variance Estimate			Separate Variance Estimate		
		t Value	Degrees of Freedom	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.
1.16	.557	-.96	121	.338	-.95	105.15	.344

Independent samples of V37

Group 1: V37      EQ 6                      Group 2: V37      EQ 9

t-test for: MKTGDIVR

	Number of Cases	Mean	Standard Deviation	Standard Error
Group 1	52	2.8173	1.449	.201
Group 2	71	2.7254	1.301	.154

F Value	2-Tail Prob.	Pooled Variance Estimate			Separate Variance Estimate		
		t Value	Degrees of Freedom	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.
1.24	.400	.37	121	.713	.36	102.87	.717

MORE

Independent samples of V37

Group 1: V37      EQ 6                      Group 2: V37      EQ 9

t-test for: TECHDIVR

		Number of Cases	Mean	Standard Deviation	Standard Error			
Group 1		52	2.5865	1.514	.210			
Group 2		71	2.8521	1.413	.168			
		Pooled Variance Estimate			Separate Variance Estimate			
F Value	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.	
1.15	.587	-1.00	121	.320	-.99	105.53	.325	

Independent samples of V37

Group 1: V37      EQ 6                      Group 2: V37      EQ 9

t-test for: ENVSDYNAM

		Number of Cases	Mean	Standard Deviation	Standard Error			
Group 1		52	3.5615	.838	.116			
Group 2		71	3.5268	.707	.084			
		Pooled Variance Estimate			Separate Variance Estimate			
F Value	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.	
1.41	.185	.25	121	.804	.24	98.49	.809	

## APPENDIX E

T-Tests of the Factor Means  
for the ICV Sub-Groups

## I. Summary of the Factor Means and Their Two-Tailed Probabilities:

Factor	A	B	A	C	B	C
SUCCESS	4.05 (.032)*	4.92	4.05 (.109)+	4.85	4.92 (.858)	4.85
PRODPERF	4.64 (.452)	4.44	4.64 (.035)*	5.38	4.94 (.216)	5.38
PRODRAD	4.36 (.800)	4.46	4.36 (.287)	4.80	4.46 (.349)	4.80
MKTGDIVR	3.77 (.539)	3.47	3.77 (.138)+	4.60	3.47 (.023)*	4.60
TECHDIVR	3.59 (.115)+	2.75	3.59 (.022)*	2.45	2.75 (.458)	2.45
ENVODYNAM	3.36 (.415)	3.61	3.36 (.403)	3.60	3.61 (.966)	3.60
PROCDIFF	4.52 (.109)+	3.64	4.52 (.015)*	3.11	3.64 (.251)	3.11
MKTGDIFFF	5.41 (.642)	5.11	5.41 (.770)	5.20	5.11 (.891)	5.20
INTGRATN	2.22 (.833)	2.33	2.22 (.024)*	3.73	2.33 (.014)*	3.73

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\* p-values where the null hypothesis was rejected  
(p is the probability that a difference at least as large as the one observed would arise if the means are really equal.)

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II. The SPSS outputs for the T-Tests begin on the pages that follow:

T-TEST /GROUPS V36 (0,1) /VARIABLES SUCCESS PRODPERF PRODRAD MKTGDIVR TECHDIVR  
ENVVDYNAM PROCDIFF MKTGDIFF INTGRATN.

Independent samples of V36

Group 1: V36 EQ 0                      Group 2: V36 EQ 1

t-test for: SUCCESS

	Number of Cases	Mean	Standard Deviation	Standard Error
Group 1	11	4.0455	1.214	.366
Group 2	18	4.9167	.862	.203

F Value	2-Tail Prob.	Pooled Variance Estimate			Separate Variance Estimate		
		t Value	Degrees of Freedom	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.
1.98	.206	-2.26	27	.032	-2.08	16.21	.054

Independent samples of V36

Group 1: V36 EQ 0                      Group 2: V36 EQ 1

t-test for: PRODPERF

	Number of Cases	Mean	Standard Deviation	Standard Error
Group 1	11	4.6364	.809	.244
Group 2	18	4.9444	1.174	.277

F Value	2-Tail Prob.	Pooled Variance Estimate			Separate Variance Estimate		
		t Value	Degrees of Freedom	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.
2.11	.232	-.76	27	.452	-.84	26.49	.411

MORE

Independent samples of V36

Group 1: V36 EQ 0 Group 2: V36 EQ 1

t-test for: PRODRAD

	Number of Cases	Mean	Standard Deviation	Standard Error
Group 1	11	4.3636	.948	.286
Group 2	18	4.4630	1.049	.247

F Value	2-Tail Prob.	Pooled Variance Estimate			Separate Variance Estimate		
		t Value	Degrees of Freedom	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.
1.22	.765	-.26	27	.800	-.26	22.99	.795

Independent samples of V36

Group 1: V36 EQ 0 Group 2: V36 EQ 1

t-test for: MKTGDIVR

	Number of Cases	Mean	Standard Deviation	Standard Error
Group 1	11	3.7727	1.148	.346
Group 2	18	3.4722	1.323	.312

F Value	2-Tail Prob.	Pooled Variance Estimate			Separate Variance Estimate		
		t Value	Degrees of Freedom	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.
1.33	.662	.62	27	.539	.65	23.65	.525

MORE

Independent samples of V36

Group 1: V36            EQ 0                    Group 2: V36            EQ 1

t-test for: TECHDIVR

	Number of Cases	Mean	Standard Deviation	Standard Error
Group 1	11	3.5909	1.411	.425
Group 2	18	2.7500	1.309	.309

		Pooled Variance Estimate			Separate Variance Estimate		
F Value	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.
1.16	.755	1.63	27	.115	1.60	20.03	.125

Independent samples of V36

Group 1: V36            EQ 0                    Group 2: V36            EQ 1

t-test for: ENVDYNAM

	Number of Cases	Mean	Standard Deviation	Standard Error
Group 1	11	3.3636	.709	.214
Group 2	18	3.6111	.822	.194

		Pooled Variance Estimate			Separate Variance Estimate		
F Value	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.
1.34	.647	-.83	27	.415	-.86	23.75	.399

MORE

Independent samples of V36

Group 1: V36            EQ 0                    Group 2: V36            EQ 1

t-test for: PROCDIFF

		Number of Cases	Mean	Standard Deviation	Standard Error			
Group 1		11	4.5227	1.498	.452			
Group 2		18	3.6389	1.326	.313			
		Pooled Variance Estimate			Separate Variance Estimate			
F Value	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.	
1.28	.634	1.66	27	.109	1.61	19.28	.124	

Independent samples of V36

Group 1: V36            EQ 0                    Group 2: V36            EQ 1

t-test for: MKTGDIFF

		Number of Cases	Mean	Standard Deviation	Standard Error			
Group 1		11	5.4091	1.357	.409			
Group 2		18	5.1111	1.811	.427			
		Pooled Variance Estimate			Separate Variance Estimate			
F Value	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.	
1.78	.354	.47	27	.642	.50	25.71	.619	

MORE

Independent samples of V36

Group 1: V36 EQ 0                      Group 2: V36 EQ 1

t-test for: INTGRATN

	Number of Cases	Mean	Standard Deviation	Standard Error
Group 1	11	2.2273	1.170	.353
Group 2	18	2.3333	1.372	.323

		Pooled Variance Estimate			Separate Variance Estimate		
F Value	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.
1.38	.619	-.21	27	.833	-.22	23.93	.826

T-TEST /GROUPS V36 (0,2) /VARIABLES SUCCESS PRODPERF PRODRAD MKTGDIVR TECHDIVR ENVVDYNAM PROCDIFF MKTGDIFF INTGRATN.

Independent samples of V36

Group 1: V36 EQ 0                      Group 2: V36 EQ 2

t-test for: SUCCESS

	Number of Cases	Mean	Standard Deviation	Standard Error
Group 1	11	4.0455	1.214	.366
Group 2	20	4.8500	1.339	.299

		Pooled Variance Estimate			Separate Variance Estimate		
F Value	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.
1.22	.774	-1.65	29	.109	-1.70	22.55	.103

MORE

Independent samples of V36

Group 1: V36 EQ 0 Group 2: V36 EQ 2

t-test for: PRODPERF

		Number of Cases	Mean	Standard Deviation	Standard Error			
Group 1		11	4.6364	.809	.244			
Group 2		20	5.3750	.930	.208			
		Pooled Variance Estimate			Separate Variance Estimate			
F Value	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.	
1.32	.667	-2.21	29	.035	-2.30	23.33	.030	

Independent samples of V36

Group 1: V36 EQ 0 Group 2: V36 EQ 2

t-test for: PRODRAD

		Number of Cases	Mean	Standard Deviation	Standard Error			
Group 1		11	4.3636	.948	.286			
Group 2		20	4.8000	1.131	.253			
		Pooled Variance Estimate			Separate Variance Estimate			
F Value	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.	
1.42	.577	-1.08	29	.287	-1.14	24.03	.264	

MORE

Independent samples of V36

Group 1: V36 EQ 0                      Group 2: V36 EQ 2

t-test for: MKTGDIVR

	Number of Cases	Mean	Standard Deviation	Standard Error
Group 1	11	3.7727	1.148	.346
Group 2	20	4.6000	1.578	.353

		Pooled Variance Estimate			Separate Variance Estimate		
F Value	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.
1.89	.303	-1.53	29	.138	-1.67	26.51	.106

Independent samples of V36

Group 1: V36 EQ 0                      Group 2: V36 EQ 2

t-test for: TECHDIVR

	Number of Cases	Mean	Standard Deviation	Standard Error
Group 1	11	3.5909	1.411	.425
Group 2	20	2.4500	1.157	.259

		Pooled Variance Estimate			Separate Variance Estimate		
F Value	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.
1.49	.439	2.43	29	.022	2.29	17.51	.035

MORE

Independent samples of V36

Group 1: V36            EQ 0                    Group 2: V36            EQ 2

t-test for: ENVDYNAM

		Number of Cases	Mean	Standard Deviation	Standard Error			
	Group 1	11	3.3636	.709	.214			
	Group 2	20	3.6000	.760	.170			
		Pooled Variance Estimate			Separate Variance Estimate			
F Value	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.	
1.15	.853	-.85	29	.403	-.87	22.00	.396	

Independent samples of V36

Group 1: V36            EQ 0                    Group 2: V36            EQ 2

t-test for: PROCDIFF

		Number of Cases	Mean	Standard Deviation	Standard Error			
	Group 1	11	4.5227	1.498	.452			
	Group 2	20	3.1125	1.441	.322			
		Pooled Variance Estimate			Separate Variance Estimate			
F Value	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.	
1.08	.844	2.57	29	.015	2.54	20.04	.019	

MORE

Independent samples of V36

Group 1: V36            EQ 0                    Group 2: V36            EQ 2

t-test for: MKTGDIFF

		Number of Cases	Mean	Standard Deviation	Standard Error
Group 1		11	5.4091	1.357	.409
Group 2		20	5.2000	2.111	.472

		Pooled Variance Estimate			Separate Variance Estimate		
F Value	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.
2.42	.153	.30	29	.770	.33	28.12	.740

Independent samples of V36

Group 1: V36            EQ 0                    Group 2: V36            EQ 2

t-test for: INTEGRATN

		Number of Cases	Mean	Standard Deviation	Standard Error
Group 1		11	2.2273	1.170	.353
Group 2		20	3.7250	1.881	.421

		Pooled Variance Estimate			Separate Variance Estimate		
F Value	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.
2.59	.126	-2.39	29	.024	-2.73	28.42	.011

MORE

T-TEST /GROUPS V36 (1,2) /VARIABLES SUCCESS PRODPERF PRODRAD MKTGDIVR TECHDIVR  
ENVDYNAM PROCDIFF MKTGDIFF INTGRATN.

Independent samples of V36

Group 1: V36 EQ 1                      Group 2: V36 EQ 2

t-test for: SUCCESS

	Number of Cases	Mean	Standard Deviation	Standard Error			
Group 1	18	4.9167	.862	.203			
Group 2	20	4.8500	1.339	.299			
		Pooled Variance Estimate			Separate Variance Estimate		
F	2-Tail Value	t	Degrees of Freedom	2-Tail Prob.	t	Degrees of Freedom	2-Tail Prob.
2.41	.074	.18	36	.858	.18	32.76	.855

Independent samples of V36

Group 1: V36 EQ 1                      Group 2: V36 EQ 2

t-test for: PRODPERF

	Number of Cases	Mean	Standard Deviation	Standard Error			
Group 1	18	4.9444	1.174	.277			
Group 2	20	5.3750	.930	.208			
		Pooled Variance Estimate			Separate Variance Estimate		
F	2-Tail Value	t	Degrees of Freedom	2-Tail Prob.	t	Degrees of Freedom	2-Tail Prob.
1.59	.326	-1.26	36	.216	-1.24	32.38	.223

MORE

Independent samples of V36

Group 1: V36 EQ 1                      Group 2: V36 EQ 2

t-test for: PRODRAD

		Number of Cases	Mean	Standard Deviation	Standard Error			
Group 1		18	4.4630	1.049	.247			
Group 2		20	4.8000	1.131	.253			
		Pooled Variance Estimate			Separate Variance Estimate			
F Value	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.	
1.16	.759	-.95	36	.349	-.95	35.96	.347	

Independent samples of V36

Group 1: V36 EQ 1                      Group 2: V36 EQ 2

t-test for: MKTGDIVR

		Number of Cases	Mean	Standard Deviation	Standard Error			
Group 1		18	3.4722	1.323	.312			
Group 2		20	4.6000	1.578	.353			
		Pooled Variance Estimate			Separate Variance Estimate			
F Value	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.	
1.42	.469	-2.37	36	.023	-2.40	35.84	.022	

MORE

## Independent samples of V36

Group 1: V36 EQ 1 Group 2: V36 EQ 2

t-test for: TECHDIVR

	Number of Cases	Mean	Standard Deviation	Standard Error
Group 1	18	2.7500	1.309	.309
Group 2	20	2.4500	1.157	.259

		Pooled Variance Estimate			Separate Variance Estimate		
F Value	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.
1.28	.601	.75	36	.458	.75	34.19	.461

## Independent samples of V36

Group 1: V36 EQ 1 Group 2: V36 EQ 2

t-test for: ENVDYNAM

	Number of Cases	Mean	Standard Deviation	Standard Error
Group 1	18	3.6111	.822	.194
Group 2	20	3.6000	.760	.170

		Pooled Variance Estimate			Separate Variance Estimate		
F Value	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.
1.17	.735	.04	36	.966	.04	34.79	.966

MORE

Independent samples of V36

Group 1: V36            EQ 1                    Group 2: V36            EQ 2

t-test for: PROCDIFF

	Number of Cases	Mean	Standard Deviation	Standard Error
Group 1	18	3.6389	1.326	.313
Group 2	20	3.1125	1.441	.322

F Value	2-Tail Prob.	Pooled Variance Estimate			Separate Variance Estimate		
		t Value	Degrees of Freedom	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.
1.18	.737	1.17	36	.251	1.17	35.98	.249

Independent samples of V36

Group 1: V36            EQ 1                    Group 2: V36            EQ 2

t-test for: MKTGDIFF

	Number of Cases	Mean	Standard Deviation	Standard Error
Group 1	18	5.1111	1.811	.427
Group 2	20	5.2000	2.111	.472

F Value	2-Tail Prob.	Pooled Variance Estimate			Separate Variance Estimate		
		t Value	Degrees of Freedom	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.
1.36	.530	-.14	36	.891	-.14	35.93	.890

MORE

Independent samples of V36

Group 1: V36      EQ 1                      Group 2: V36      EQ 2

t-test for: INTGRATN

	Number of Cases	Mean	Standard Deviation	Standard Error
Group 1	18	2.3333	1.372	.323
Group 2	20	3.7250	1.881	.421

F	2-Tail Value	2-Tail Prob.	Pooled Variance Estimate			Separate Variance Estimate		
			t Value	Degrees of Freedom	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.
1.88		.196	-2.58	36	.014	-2.62	34.59	.013

**APPENDIX F**

**T-Tests: PRODRAD in the ICV Sub-Groups  
versus the MDIV and SF Groups**

## T-TEST /GROUPS V36 (2,4) /VARIABLES PRODRAD.

Independent samples of V36

Group 1: V36 EQ 2

Group 2: V36 EQ 4

t-test for: PRODRAD

	Number of Cases	Mean	Standard Deviation	Standard Error
Group 1	20	4.8000	1.131	.253
Group 2	52	3.8269	1.362	.189

		Pooled Variance Estimate			Separate Variance Estimate		
F	2-Tail Value Prob.	t	Degrees of Freedom	2-Tail Prob.	t	Degrees of Freedom	2-Tail Prob.
1.45	.378	2.84	70	.006	3.08	41.30	.004

## T-TEST /GROUPS V36 (2,7) /VARIABLES PRODRAD.

Independent samples of V36

Group 1: V36 EQ 2

Group 2: V36 EQ 7

t-test for: PRODRAD

	Number of Cases	Mean	Standard Deviation	Standard Error
Group 1	20	4.8000	1.131	.253
Group 2	71	4.0563	1.264	.150

		Pooled Variance Estimate			Separate Variance Estimate		
F	2-Tail Value Prob.	t	Degrees of Freedom	2-Tail Prob.	t	Degrees of Freedom	2-Tail Prob.
1.25	.604	2.38	89	.020	2.53	33.58	.016

APPENDIX G

T-Tests: STRATSIG and DIVERSIF  
in the ICV Sub-Groups

Independent samples of V38

Group 1: V38 EQ 2

Group 2: V38 EQ 3

t-test for: STRATSIG

	Number of Cases	Mean	Standard Deviation	Standard Error
Group 1	18	4.6327	.479	.113
Group 2	7	4.8254	.405	.153

F Value	2-Tail Prob.	Pooled Variance Estimate			Separate Variance Estimate		
		t Value	Degrees of Freedom	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.
1.40	.716	-.94	23	.357	-1.01	12.94	.330

Independent samples of V38

Group 1: V38

EQ 2

Group 2: V38

EQ 3

t-test for: DIVERSIF

	Number of Cases	Mean	Standard Deviation	Standard Error
Group 1	18	3.2778	.737	.174
Group 2	7	4.0357	.783	.296

F Value	2-Tail Prob.	Pooled Variance Estimate			Separate Variance Estimate		
		t Value	Degrees of Freedom	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.
1.13	.775	-2.27	23	.033	-2.21	10.41	.051

T-TEST /GROUPS V38 (2,4) /VARIABLES STRATSIG DIVERSIF.

Independent samples of V38

Group 1: V38 EQ 2                      Group 2: V38 EQ 4

t-test for: STRATSIG

	Number of Cases	Mean	Standard Deviation	Standard Error
Group 1	18	4.6327	.479	.113
Group 2	26	4.8098	.910	.179

F	2-Tail Value	2-Tail Prob.	Pooled Variance Estimate		Separate Variance Estimate				
			t Value	Degrees of Freedom	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.	
3.61		.008	-.75	42	.455		-.84	39.66	.407

Independent samples of V38

Group 1: V38                      EQ 2                      Group 2: V38                      EQ 4

t-test for: DIVERSIF

	Number of Cases	Mean	Standard Deviation	Standard Error
Group 1	18	3.2778	.737	.174
Group 2	26	3.3173	1.006	.197

F	2-Tail Value	2-Tail Prob.	Pooled Variance Estimate		Separate Variance Estimate				
			t Value	Degrees of Freedom	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.	
1.86		.187	-.14	42	.888		-.15	41.82	.881

T-TEST /GROUPS V38 (3,4) /VARIABLES STRATSIG DIVERSIF.

Independent samples of V38

Group 1: V38 EQ 3                      Group 2: V38 EQ 4

t-test for: STRATSIG

	Number of Cases	Mean	Standard Deviation	Standard Error
Group 1	7	4.6254	.405	.153
Group 2	26	4.8098	.910	.179

F Value	2-Tail Prob.	Pooled Variance Estimate			Separate Variance Estimate		
		t Value	Degrees of Freedom	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.
5.05	.051	.04	31	.965	.07	23.14	.948

Independent samples of V38

Group 1: V38                      EQ 3                      Group 2: V38                      EQ 4

t-test for: DIVERSIF

	Number of Cases	Mean	Standard Deviation	Standard Error
Group 1	7	4.0357	.783	.296
Group 2	26	3.3173	1.006	.197

F Value	2-Tail Prob.	Pooled Variance Estimate			Separate Variance Estimate		
		t Value	Degrees of Freedom	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.
1.65	.553	1.74	31	.091	2.02	11.96	.066

APPENDIX H

Discriminant Analyses for the  
ICV, MDIV, and SF Groups

- - - - - D I S C R I M I N A N T   A N A L Y S I S   - - -

On groups defined by V37

103 (unweighted) cases were processed.  
 0 of these were excluded from the analysis.  
 103 (unweighted) cases will be used in the analysis.

Number of Cases by Group

V37	Number of Cases		Label
	Unweighted	Weighted	
3	51	51.0	S1.0
6	52	52.0	S2.0
Total	103	103.0	

Canonical Discriminant Functions

Fcn	Eigenvalue	Pct of Variance	Cum Pct	Canonical Corr	After Wilks'		Chisquare	DF	Sig
					Fcn	Lambda			
1*	.2991	100.00	100.00	.4799	0	.7697	25.778	5	.0001

\* marks the 1 canonical discriminant functions remaining in the analysis.

MORE

Unstandardized Canonical Discriminant Function Coefficients

	FUNC 1
SUCCESS	-.2891800
PRODPERF	-.2359700
PRODRAD	.4623363
MKTGDIVR	.4926237
TECHDIVR	.1592554
(constant)	-1.438229

Canonical Discriminant Functions evaluated at Group Means (Group Centroids)

Group	FUNC 1
3	.54689
6	-.53637

Test of equality of group covariance matrices using Box's M

The ranks and natural logarithms of determinants printed are those of the group covariance matrices.

Group Label	Rank	Log Determinant
3	5	1.540104
6	5	1.864354
Pooled Within-Groups Covariance Matrix	5	1.853378

Box's M	Approximate F	Degrees of freedom	Significance
15.104	.95338	15,	41038.0 .5029

Symbols used in Plots

Symbol	Group	Label
1	3	
4	6	

Classification Results -

Actual Group	No. of Cases	Predicted Group Membership	
		3	6
Group 3	51	38 74.5%	13 25.5%
Group 6	52	11 21.2%	41 78.8%

Percent of "grouped" cases correctly classified: 76.70%

Classification Processing Summary

103 Cases were processed.  
 0 Cases were excluded for missing or out-of-range group codes.  
 0 Cases had at least one missing discriminating variable.  
 103 Cases were used for printed output.

- - - - - D I S C R I M I N A N T   A N A L Y S I S   -

On groups defined by V37

122 (unweighted) cases were processed.  
 0 of these were excluded from the analysis.  
 122 (unweighted) cases will be used in the analysis.

Number of Cases by Group

V37	Number of Cases		Label
	Unweighted	Weighted	
3	51	51.0	
9	71	71.0	
Total	122	122.0	

Canonical Discriminant Functions

Fcn	Eigenvalue	Pct of Variance	Cum Pct	Canonical Corr	After Wilks' Fcn	Lambda	Chisquare	DF	Sig
1*	.2405	100.00	100.00	.4403	0	.8061	25.650	2	.0000

\* marks the 1 canonical discriminant functions remaining in the analysis.

Unstandardized Canonical Discriminant Function Coefficients

	FUNC 1
PRODRAD	.2241539
MKTGDIVR	.6777617
(constant)	-3.168634

Canonical Discriminant Functions evaluated at Group Means (Group Centroids)

Group	FUNC 1
3	.57392
9	-.41225

Test of equality of group covariance matrices using Box's M

The ranks and natural logarithms of determinants printed are those of the group covariance matrices.

Group Label	Rank	Log Determinant
3	2	.840259
9	2	.937861
Pooled Within-Groups Covariance Matrix	2	.923652

Box's M	Approximate F	Degrees of freedom	Significance
3.1750	1.0385	3,	978423.0 .3744

Symbols used in Plots

Symbol	Group	Label
1	3	
7	9	

Classification Results -

Actual Group	No. of Cases	Predicted Group Membership	
		3	9
Group 3	51	35 68.6%	16 31.4%
Group 9	71	19 26.8%	52 73.2%

Percent of "grouped" cases correctly classified: 71.31%

Classification Processing Summary

122 Cases were processed.  
 0 Cases were excluded for missing or out-of-range group codes.  
 0 Cases had at least one missing discriminating variable.  
 122 Cases were used for printed output.

- - - - - D I S C R I M I N A N T   A N A L Y S I S   -

On groups defined by V37

123 (unweighted) cases were processed.  
0 of these were excluded from the analysis.  
123 (unweighted) cases will be used in the analysis.

Number of Cases by Group

V37	Number of Cases		Label
	Unweighted	Weighted	
6	52	52.0	
9	71	71.0	
Total	123	123.0	

Canonical Discriminant Functions

Fcn	Eigenvalue	Pct of Variance	Cum Pct	Canonical Corr	After Wilks'	Fcn	Lambda	Chisquare	DF	Sig
1*	.0373	100.00	100.00	.1896	:	0	.9640	4.394	2	.1112

\* marks the 1 canonical discriminant functions remaining in the analysis.

Unstandardized Canonical Discriminant Function Coefficients

	FUNC 1
SUCCESS	.8775288
PRODRAD	-.6229087
(constant)	-1.678761

Canonical Discriminant Functions evaluated at Group Means (Group Centroids)

Group	FUNC 1
6	.22381
9	-.16391

Test of equality of group covariance matrices using Box's M

The ranks and natural logarithms of determinants printed are those of the group covariance matrices.

Group Label	Rank	Log Determinant
6	2	.680651
9	2	.458188
Pooled Within-Groups Covariance Matrix	2	.565149

Box's M	Approximate F	Degrees of freedom	Significance
1.5967	.52239	3,	1186125.2 .6669

Symbols used in Plots

Symbol	Group	Label
1	6	
4	9	

Classification Results -

Actual Group	No. of Cases	Predicted Group Membership	
		6	9
Group 6	52	29 55.8%	23 44.2%
Group 9	71	33 46.5%	38 53.5%

Percent of "grouped" cases correctly classified: 54.47%

Classification Processing Summary

123 Cases were processed.  
 0 Cases were excluded for missing or out-of-range group codes.  
 0 Cases had at least one missing discriminating variable.  
 123 Cases were used for printed output.

APPENDIX I

Discriminant Analysis Across the  
ICV, MDIV, and SF Groups

- - - - - D I S C R I M I N A N T   A N A L Y S I S   - -

On groups defined by V37

174 (unweighted) cases were processed.  
0 of these were excluded from the analysis.  
174 (unweighted) cases will be used in the analysis.

Number of Cases by Group

V37	Number of Cases		Label
	Unweighted	Weighted	
3	51	51.0	
6	52	52.0	
9	71	71.0	
Total	174	174.0	

Canonical Discriminant Functions

Fcn	Eigenvalue	Pct of Variance	Cum Pct	Canonical Corr	After Wilks'	Fcn	Lambda	Chisquare	DF	Sig
1*	.2065	89.69	89.69	.4137	:	0	.8096	35.905	6	.0000
2*	.0237	10.31	100.00	.1522	:	1	.9768	3.987	2	.1362

\* marks the 2 canonical discriminant functions remaining in the analysis.

Unstandardized Canonical Discriminant Function Coefficients

	FUNC 1	FUNC 2
SUCCESS	-.2779723	.7286578
PRODRAD	.3210851	-.5800451
MKTGDIVR	.6237162	.3255912
(constant)	-1.971375	-2.053787

Canonical Discriminant Functions evaluated at Group Means (Group Centroids)

Group	FUNC 1	FUNC 2
3	.69704	.02052
6	-.34319	.20293
9	-.24934	-.16336

Test of equality of group covariance matrices using Box's M

The ranks and natural logarithms of determinants printed are those of the group covariance matrices.

Group Label	Rank	Log Determinant
3	3	1.135608
6	3	1.287326
9	3	.910767
Pooled Within-Groups Covariance Matrix	3	1.159493

Box's M	Approximate F	Degrees of freedom	Significance
12.086	.98082	12,	118637.0 .4643

Classification Results -

Actual Group	No. of Cases	Predicted Group Membership		
		3	6	9
Group 3	51	32 62.7%	6 11.8%	13 25.5%
Group 6	52	10 19.2%	23 44.2%	19 36.5%
Group 9	71	17 23.9%	24 33.8%	30 42.3%

Percent of "grouped" cases correctly classified: 48.85%

Classification Processing Summary

174 Cases were processed.  
 0 Cases were excluded for missing or out-of-range group codes.  
 0 Cases had at least one missing discriminating variable.  
 174 Cases were used for printed output.

APPENDIX J

Discriminant Analyses of the ICV Sub-Groups

- - - - - D I S C R I M I N A N T   A N A L Y S I S   -

On groups defined by V36

51 (unweighted) cases were processed.  
 2 of these were excluded from the analysis.  
 2 had missing or out-of-range group codes.  
 49 (unweighted) cases will be used in the analysis.

Number of Cases by Group

V36	Number of Cases		Label
	Unweighted	Weighted	
0	11	11.0	
1	18	18.0	
2	20	20.0	
Total	49	49.0	

Canonical Discriminant Functions

Fcn	Eigenvalue	Pct of Variance	Cum Pct	Canonical Corr	After Wilks'	Fcn	Lambda	Chisquare	DF	Sig
					:	0	.5378	27.291	10	.0023
1*	.6124	79.99	79.99	.6163	:	1	.8672	6.270	4	.1799
2*	.1532	20.01	100.00	.3644	:					

\* marks the 2 canonical discriminant functions remaining in the analysis.

Unstandardized Canonical Discriminant Function Coefficients

	FUNC 1	FUNC 2
SUCCESS	.2210412	-.6451185
PRODPERF	.4435935	.1538391
MKTGDIVR	.3431852	.3279512
TECHDIVR	-.4044604	.4462874
INTGRATN	.3997825	.1821961
(constant)	-4.662183	-.8419117

Canonical Discriminant Functions evaluated at Group Means (Group Centroids)

Group	FUNC 1	FUNC 2
0	-.97852	.50719
1	-.36990	-.46196
2	.87110	.13681

Test of equality of group covariance matrices using Box's M

The ranks and natural logarithms of determinants printed are those of the group covariance matrices.

Group Label	Rank	Log Determinant
0	5	.690658
1	5	1.482415
2	5	2.362384
Pooled Within-Groups Covariance Matrix	5	2.201446

Box's M	Approximate F	Degrees of freedom	Significance
24.274	.66635	30,	3841.7 .9162

Classification Results -

Actual Group	No. of Cases	Predicted Group Membership		
		0	1	2
Group 0	11	8 72.7%	2 18.2%	1 9.1%
Group 1	18	4 22.2%	10 55.6%	4 22.2%
Group 2	20	2 10.0%	3 15.0%	15 75.0%
Ungrouped Cases	2	0 .0%	2 100.0%	0 .0%

Percent of "grouped" cases correctly classified: 67.35%

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