To the Graduate Council:

I am submitting herewith a dissertation written by Mary S. Spann entitled "Resource Acquisition Strategies of Entrepreneurs: The Use of Outside Resources." I have examined the final copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Business Administration.

Alex Miller, Major Professor

We have read this dissertation
and recommend its acceptance:

Accepted for the Council:

Vice Provost and Dean of The
Graduate School

RESOURCE ACQUISITION STRATEGIES OF ENTREPRENEURS: THE USE OF OUTSIDE RESOURCES

A Dissertation

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Degree

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ABSTRACT

This research was concerned with how entrepreneurs acquire resources in starting new businesses. Emphasis was placed on the strategy of using outside resources which was characterized by the efficient use of a resource which had been acquired using short term, recurring expenses and which minimized the drain on the firm's assets. In addition, this work was also concerned with discovering what other resource acquisition strategies were used by entrepreneurs

A mail questionnaire and field interviews were used to collect quantitative and qualitative data. A general hypothesis was tested for five different kinds of resources: technical, marketing, financial, and general management information, as well as R&D and production equipment. The hypothesis suggested that, given equal startup complexity, firms which utilized a high degree of outsourcing would take less time to achieve firm milestones than firms which utilized less outsourcing.

The relationship was shown to be statistically significant for technical information but in the direction opposite from that predicted. Technology-based companies may be better off if the technical ideas are in the heads of the founders. Also, qualitative data revealed that entrepreneurs

used many pre-venture resource acquisition strategies which influenced the amount of outsourcing used after startup.

Several generalized resource acquisition strategies were uncovered in the qualitative portion of the study. These included pre-venture searches, partners with resources, transfers from parent and incubator organizations, bridge businesses, and the use of personal resources for business purposes.

The quantitative and qualitative findings were merged into a new expanded model of the resource acquisition strategies of entrepreneurs. Several propositions were suggested to test the tenets of the model.

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CHAPTER I

THE RESOURCE ACQUISITION STRATEGIES OF ENTREPRENEURS

Should startup firms lease rather than buy equipment? Buy rather than make components? Hire part-time employees rather than full-time employees? License a proven technology rather than develop a new technology within the firm? Are there ways for entrepreneurs to acquire resources which enhance the performance of startup companies?

Conventional wisdom in the field of entrepreneurship has answered yes to questions like those posed above. Three different sources of literature in entrepreneurship lend support to the affirmative response. First, the concept of a special entrepreneurial approach to resource acquisition is part of a widely disseminated perspective on entrepreneurship (Stevenson, 1983; Stevenson & Gumpert, 1985; Stevenson, Roberts & Grousbeck, 1985; Stevenson & Sahlman, 1986) and part of a major teaching model in the field (Timmons, Smollen & Dingee, 1985). Briefly, proponents of this perspective contend that successful entrepreneurs, in acquiring resources, "learn to use other people's resources well" and are "adept at using the skills, talents, and ideas of others" (Stevenson, et al., 1985: 9, 10).

The second source of literature is the research investigating the impact of outside consulting services on new firm creation and development (e. g., Chrisman, Hoy & Robinson, 1987; Hoy, 1982; Robinson, 1982). This research is based on the same idea: providing outside resources (here in the form of outside consulting services) to entrepreneurs should have a positive impact on new firm creation and performance.

The third source is the new business incubator literature (e. g., Gatewood, Ogden & Hoy, 1985; Merrifield, 1987; Smilor & Gill, 1986). The new business incubator is based on another variation of the same idea: providing free or low cost space, administrative support, and consulting services to entrepreneurs will enhance new business creation and development.

Clearly each make or buy decision, lease or buy decision, or decisions about the use of outside consultants or licensing technology are tactical issues, relatively unimportant individually. Of interest is the aggregate stream of decisions which "provides a strategic posture from which to conduct the trial and error testing of ideas so common to new ventures" (Timmons et at., 1985: 392).

This study explored and the relationship between resource acquisition and firm performance. Of special interest was the resource acquisition strategy of using

outside resources and the impact of this strategy on firm performance. This relationship is modeled in Figure 1. The model suggests that the use of outside resources has an effect on firm performance, specifically on the time the firm takes to achieve performance milestones. The model also proposes that there is a need to control for the complexity involved in the startup of the firm. The research hypothesis states that, given equal startup complexity, firms which utilize higher degrees of outsourcing will take less time to reach performance milestones than firms which utilize less outsourcing.

The model in Figure 1 is a very simple one. Since this area of entrepreneurship is little understood, it is particularly appropriate to study it qualitatively (Katz, 1989). Qualitative methods allow the researcher to explore the "how," "why," and "what else" questions (Yin, 1984) that lend understanding to new areas of inquiry. This work also sought to add breadth and depth to an understanding of the resource acquisition strategies of entrepreneurs, especially those strategies which encompassed or were related to the use of outside resources. To this end, qualitative data was also collected.

A final purpose of this study was to marry the quantitative and qualitative findings. The model in

THE GENERAL MODEL

THE RESEARCH MODEL

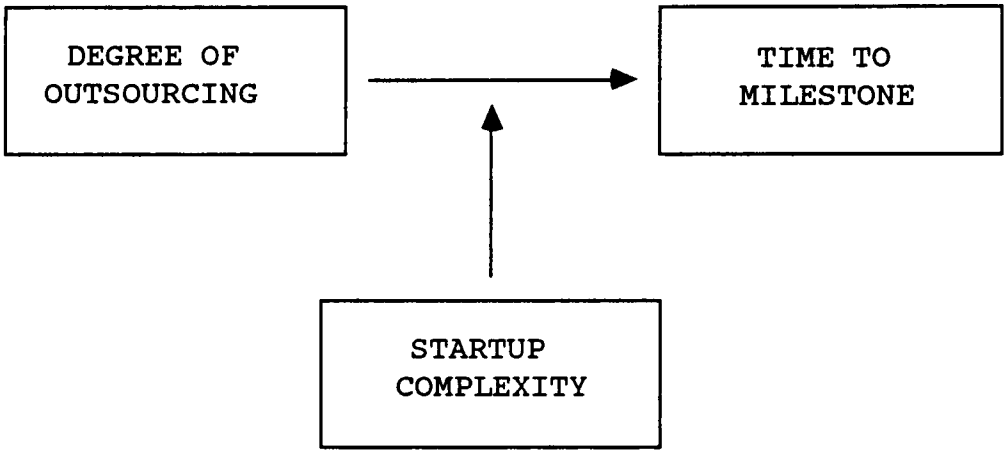


Figure 1
General and Research Models

Figure 1 was tested using quantitative data and modified using qualitative data. The final result is a revised and expanded model of how entrepreneurs acquire resources in the startup of new firms and how the strategy chosen has an impact on firm performance.

This work has significance in several areas in the field of entrepreneurship. First, it tests an idea that is widely disseminated in literature read by researchers, teachers, and practitioners. Moreover, the work supports the perspective that entrepreneurship is a process, not a character trait, by developing further one part of that process: resource acquisition. Furthermore, this work contributes to the stream of thought which proposes that entrepreneurs (and managers) make strategic choices which affect the outcomes of their firms. The perspective here suggests that entrepreneurs can make strategic choices about resource acquisition and that these choices matter in terms of firm performance, specifically in saving time critical in the early development of firms. If this effect can be documented, then entrepreneurs should be able to enhance their chances for success by adopting some fairly simple strategies.

CHAPTER II

LITERATURE REVIEW

The literature review begins with an explanation of what using outside resources means. This explanation is derived from a widely disseminated normative literature which recommends that entrepreneurs use outside resources to improve firm performance. The empirical literature in entrepreneurship on the use of two sets of outside resources, outside consultants and new business incubators, is discussed next. This literature confirms that a relationship exists between the use of some kinds of outside resources and some measures of firm performance.

Following this is a discussion of the measurement of performance in new firms and a suggestion that new firm performance might also be measured as the achievement of milestones. The moderating variable, startup complexity, is discussed next. This chapter ends with several explanations of why the use of outside resource could result in the more rapid achievement of firm milestones.

1. OUTSIDE RESOURCES IN THE NORMATIVE LITERATURE

Howard Stevenson, Jeffrey Timmons, and their co-authors are the major contributors to the normative literature on the use of outside resources by entrepreneurs (Stevenson, 1983; Stevenson & Gumpert, 1985; Stevenson, et al., 1985; Stevenson & Sahlman, 1986; Timmons, et al., 1985). Stevenson's primary concern is entrepreneurship in corporations and, as such, would not necessarily be relevant to an understanding of the use of outside resources by entrepreneurs in independent new startups. However, Stevenson's ideas serve as the foundation for the thinking of Timmons, who advises entrepreneurs, in the early stages of business development, to use "other people's resources" (Timmons, et al.,1985: 390) or outside resources. Consequently, it is important to understand the work of Stevenson.

Stevenson: Promoters and Trustees

In developing a "rough paradigm of entrepreneurship" (Stevenson, et al., 1985: 2), Stevenson describes a range of behaviors bounded on one end by the behaviors of the promoter and on the other by those of the trustee. According to Stevenson, the promoter is opportunity driven, willing to pursue that opportunity whether or not he owns the necessary resources. In contrast, the trustee

only seeks opportunities which are compatable with resources his company owns. Furthermore, the promoter, in any new business venture, makes only a small initial commitment of resources and is, consequently, able to abandon a failing venture quickly. The trustee, however, makes a large-scale investment of resources and, as a consequence, is slow to abandon a failing venture.

The promoter and the trustee represent extremes. Stevenson maintains that the entrepreneur is not identical to the promoter but occupies a behavioral space much closer to the promoter's end of the spectrum than to the trustee's end. The entrepreneur behaves considerably more like the promoter than the trustee. Stevenson is concerned with distinguishing between the behavior of the promoter and the trustee "to identify those practices which encourage or inhibit entrepreneurship in organizations" (Stevenson, et al., 1985: 3).

According to Stevenson, entrepreneurial behavior exists when a minimum of resources are committed initially to pursue an opportunity. In addition, resources must be committed in a "multi-stage process with minimum exposure at each stage" (Stevenson, et al., 1985: 8). Only enough of a resource should be used to obtain "an appropriate level of resource intensity for the task" (Stevenson, et al., 1985: 9). To bridge the gap between the resources owned by the firm and those required to pursue the

opportunity, a manager acting like an entrepreneur acquires the resources of other people through episodic use or rent. When managers in organizations behave as described above, Stevenson maintains that they are acting like entrepreneurs.

Stevenson's thinking is based on the premise that for firms to survive in today's highly competitive and rapidly changing environment, they must be innovative, or entrepreneurial, and capable of responding to changes quickly. Stevenson's recommendations on what it takes for managers to act like entrepreneurs addresses his concerns about the ability of American firms to thrive in this competitive and changing environment. He maintains that if managers act like entrepreneurs in their pursuit of opportunities and corresponding acquisition and use of resources, their firms will have an advantage. This advantage will be based on increased flexibility, reduced risk, and lowered fixed costs (Stevenson, et al., 1985).

Timmons: Other People's Resources

Stevenson maintains that corporate managers are acting like entrepreneurs when they use outside resources, and this behavior creates an advantage for the corporation. Timmons recommends that entrepreneurs in starting new businesses should also use outside resources to create an advantage for their new enterprises.

The viewpoint of Timmons and his co-authors is not based on empirical data in a conventional sense, but is "built on knowledge and experience gained from working with real entrepreneurs launching real companies" (Timmons, et al., 1985: xiii). Timmons and his colleagues collectively claim over 40 years of experience working with entrepreneurs and are themselves the founders of a venture capital firm. While their viewpoint is normative, it is also based on considerable, if informal, field research. The advice they render to aspiring entrepreneurs is based on their observations of the practices of successful entrepreneurs.

The framework of Timmons and his co-authors has three major tenets: (1) use "other people's resources" (Timmons et al., 1985: 389), (2) "control and use rather than own" (Timmons et al., 1985: 391), and (3) "commit and decommit [resources] quickly" (Timmons, et al., 1985: 392). Each piece of advice is discussed below.

Other people's resources. Timmons' approach recommends that entrepreneurs minimize the resources used to pursue an opportunity. He encourages entrepreneurs to use the resources of friends, relatives, and business associates who may be willing to provide free space or equipment. Doing a little more with a little less means an entrepreneur needs less capital. The practice of using

other people's resources also includes committing resources a step at a time.

> Why do successful entrepreneurs take this approach? They know their response times have to be short if they are to be competitively vibrant. They know that the decision windows are narrow and move rapidly. Under these normal operating circumstances that entrepreneurs thrive on, it is extremely difficult to predict accurately the resources necessary to execute an opportunity since, as we saw earlier, it is also in a constant state of flux. The flexibility gained by a piece-meal commitment of resources can translate into one of those 'unfair advantages' that entrepreneurs manage to create for themselves (Timmons et al., 1985: 391).

Control and use rather than own. Successful entrepreneurs do not want ownership, but control and use, of a resource. The successful entrepreneur says, "All I need from a resource is the ability to use it" (Stevenson, et al., 1985: 9). Entrepreneurs can control and use resources by renting rather than purchasing and by using the temporary services of outside professionals such as lawyers, CPAs, and business advisors rather than by hiring them.

One advantage of a control-and-use resource strategy is reducing the risk of pursuing the opportunity. Less capital is required. Fixed costs are lowered, facilitating a lower breakeven point. Another advantage is that the entrepreneur can avoid the risk of

obsolescence and the inflexibility that comes with owning resources.

Rapid commitment. Finally, successful entrepreneurs develop a capacity to commit and decommit resources quickly. This characteristic is really a by-product of the resource strategies discussed above -- minimizing resource ownership by using the resources of other people and committing resources minimally at stages as they are needed. These tactics give the successful new venture flexibility, resilience, and responsiveness; all are advantages in rapidly changes markets (Timmons, et al., 1985).

Timmons and his co-authors point out that decisions on the use of other people's resources, especially lease or buy decisions are not simple ones. Numerous complex and interrelated factors are important in making lease or buy decisions including tax, financial, and risk considerations. For established firms, the literature suggests that each decision is based on highly idiosyncratic circumstances (Delisle, Guinipero, & Hillison, 1987; Gatty & Finney, 1987; Healton, 1986; Hindin, 1984; Manley, 1987; Nessen, 1988; Smith & Wakeman, 1985; Wolfson, 1985). The advice given to entrepreneurs recognizes these complications.

> ...we do not want to make such decisions seem to be simpler than they are. Instead we want to emphasize that successful entrepreneurs appear to make a strategic choice that favors controlling and using resources rather than owning them (Timmons et al., 1985: 392).

Explanation of Outside Resources

The concept of outside resources is not defined in the entrepreneurship literature. Instead the literature provides examples of ways firms obtain outside resources. Some examples of the use of outside resources include renting state-of-the-art circuit testing equipment (Stevenson, et al., 1985), borrowing a WATS line from a friend, utilizing an architect on a project-by-project basis, using the services of an outside lawyer (Timmons, et al., 1985), obtaining free office space in a new business incubator (Smilor & Gill, 1986), and using a free Small Business Development Center consultant (Chrisman, et al., 1987).

All of these examples describe different transactions which could be used to obtain both physical and human resources. For obtaining physical resources, the literature describes transactions such as purchasing, renting, borrowing, or bartering. For human resources, the examples include transactions with full-time employees, temporary employees, paid outside consultants, free outside consultants, friends, and associates.

In addition to describing different resource acquisition transactions, the literature describes four interrelated dimensions of these transactions. These four dimensions, which will be discussed below, include (1) the efficient utilization of the capacity of the resource, (2) the pattern of investment use to acquire the resource, (3) the duration of the contract used to acquire the resource, and (4) the extent of the drain on the firm's assets when the resource is acquired. For the purpose of this research, these dimensions are important because they provide a framework for defining and measuring the construct: outside resources.

Aspiring entrepreneurs have been advised to emulate successful entrepreneurs by using outside resources (Stevenson, et al., 1985; Timmons, et al., 1985). The transaction used in acquiring the resource determines whether it is an outside resource. Transactions associated with the use of outside resources are those which result in the efficient utilization of the capacity of a resource (dimension 1) which is acquired through recurring (dimension 2), short term (dimension 3) contracts and which minimizes drain on the assets of the firm (dimension 4) (Stevenson, et al., 1985; Timmons et al., 1985). Each of these dimensions will now be explained more fully.

The efficient utilization of capacity. Successful entrepreneurs choose an "appropriate level of resource intensity for the task" (Stevenson et al., 1985: 9). This requires matching the capacity of the resource with the amount of the resource necessary to sustain operations. For example, a full-time secretary provides 40 hours of secretarial services per week; this is the capacity of a full-time secretary. A new, small firm may only need 20 hours of secretarial services per week. This firm would match its need for 20 hours of secretarial services with a part-time secretary who worked 20 hours per week.

Specialized resources often have total capacities beyond that needed by a firm, especially a new, small firm. Specialized resources are those which have a limited function or narrow expertise. Some examples include a highly specialized AVLIS design engineer, a high technology patent attorney, and a high speed centrifuge. A small firm which needs a high speed centrifuge for only a few hours per week can match its need with capacity by borrowing time on a centrifuge owned by another organization.

Stevenson, Timmons, and their co-authors argue for the use of temporary employees, consultants, and specialists to match capacity with need. Similarly, these authors maintain that specialized equipment and other physical assets should be rented on an "as needed" basis

so that capacity and need are closely matched (Stevenson, et al., 1985; Timmons, et al., 1985).

Pattern of investment. Pattern of investment is defined as the timing and the amount of an investment made to obtain a resource. Investment patterns can range from a large, lump-sum investment to a small, incremental one. Consider some investment patterns that could be used to obtain equipment: purchased and paid-in-full, purchased with an initial down payment and monthly payments, and leased with monthly lease payments.

Stevenson, Timmons, and their co-authors also argue that successful entrepreneurs make small, incremental investments in their firms (Stevenson et al., 1985; Timmons, et al., 1985). These small incremental investments offer an early, cheap peek at a business opportunity and a chance of a quick, inexpensive withdrawal. Small incremental investments mean that entrepreneurs are able to operate with less capital, and this saves entrepreneurs time because they have less capital to raise (Bruno & Tyebjee, 1985).

Duration of contracts. Contracts can vary in duration. Stevenson, Timmons, and their colleagues argue that the duration of contracts (formal or implied) should be shorter rather than longer (Stevenson, et al., 1985;

Timmons et al., 1985). They maintain that, in their experience, successful entrepreneurs utilize the shortest contracts (formal or implied) possible. Short contracts allow these entrepreneurs to "commit and decommit resources" quickly (Timmons et al., 1985: 392) and to make "episodic use" of needed resources (Stevenson et al., 1985: 10). For example, according to the Stevenson-Timmons perspective, a monthly rental is preferable to a year long lease, which is, in turn, preferable to ownership (the longest duration).

Contract duration is also an issue with human resources, but with a difference. Many employees do not have formal contracts which specify the length of the employment period. Most employers retain the right to fire an employee at-will. Yet most employment relationships assume a long term commitment (an implied contract), and here the Stevenson-Timmons perspective argues that the implied contract should be shorter rather than longer. This logic argues that hiring part-time employees and consultants is preferable to hiring full-time employees.

Drain on assets. A new firm inevitably faces financial constraints and, as Stevenson and Timmons point out, must minimize the drain on its assets from each new resource acquired. As the cost of the acquired resource

increases, measured as a percent of the firm's available assets, the drain on the firm's assets increases. The Stevenson-Timmons logic argues that renting resources is superior to purchasing them, and sub-contracting is superior to self-manufacture.

Consider a firm that needs a delivery truck once a week. The logic that has been developed above suggests that the truck should be rented by the day. This is a sound practice because it matches need with capacity, uses an incremental commitment of funds, has a short contract of one day, but also requires a much smaller percentage of the firm's assets than would be required if the truck were purchased. The objectives of minimizing asset drain include lower fixed costs, increased flexibility, and lower overall startup costs.

Summary: Definition of Outside Resources

The extent to which a firm uses outside resources depends on (1) the extent to which the transaction used to obtain the resource results in the efficient utilization of the capacity of the resource, (2) the pattern of the investment used to acquire the resource, (3) the duration of the contract involved in the acquisition, and (4) the drain on the firm's assets cause by the acquisition. The transactions associated with the use of outside resources are those which result in the efficient utilization of the

capacity of a resource which is acquired through recurring, short term contracts and which minimizes the drain on the assets of the firm.

2. THE USE OF OUTSIDE CONSULTANTS

In studies of organizations, newness and smallness are often confounded since new firms are most often small firms (Whorley & Brittain, 1986). This is true in the entrepreneurship literature in general and in the literature on the use of outside consultants as well. In many studies, researchers have used samples which include both new small firms and mature small firms. Consequently, the literature on the use of outside consultants by both new and small businesses will be reviewed here.

The primary focus here is on empirical studies of the relationship between the use of outside consultants and firm performance. However, some normative literature is presented first to explain why the use of outside consultants should benefit new businesses.

Advantages of Outside Consultants

Outside consultants can be used to compensate for the managerial shortcomings of new business managers. Poor management is the leading cause of business failure

according to Applebaum and Hinds (1984). Some managerial shortcomings are related to the planning function (Bracker & Pearson, 1985; Robinson, Pearce, Vozikis & Mescon, 1984). Pioneering research in strategic management has linked planning to improved firm performance (Ansoff, Avner, Brandenburg, Portner & Radosvich, 1970; Herold, 1972; Schoeffer, Buzzell & Heaney, 1974; Thune & House, 1974). The logic which supports the use of outside planners argues (1) most new managers lack planning skills; (2) lack of planning leads to poor organizational performance; (3) outside consultants can supply the planning skills new managers lack; therefore, (4) the use of outside consultants should improve firm performance.

Other explanations of the benefits of outside consultants are related to resource-constraints in new and small businesses. Managers of these businesses often lack in-depth skills and experience in technical as well as managerial areas (Stevenson & Sahlman, 1988). Consultants are recommended when the company has a temporary need for specialized knowledge and technical skills, especially when these skills are needed to meet an important deadline (Brady, 1986; Davidson, 1986).

Economics are also considered in using outside consultants. An outside consultant is recommended when the short-term costs of giving an assignment to a consultant are less than long term costs of giving the

assignment to company personnel (Brady, 1986). The economic gains which accrue with outside consultants also include avoiding the costs of employee benefits.

Outside consultants can save time for firms. The outside consultant's experience with problems in other companies may speed up the solution to a similar problem in another firm (Brady, 1986). In addition, using a temporary consultant may eliminate the three to six month period it can take to hire a new employee (Personnel, 1986).

Empirical Studies on the Use of Outside Consultants

Many studies on the use of outside consultants explored the impact of consulting services from Small Business Institutes (SBI), Small Business Development Centers (SBDC), or other university-related programs concerned with new business formation and small business performance. Firms received help in numerous areas including assistance in functional areas, marketing research, strategic planning, and general administration. These studies are summarized in Table 1 and discussed individually below.

In an early study, Hoy (1982) compared the effectiveness of SBI and SBDC consulting for new business ventures and concluded that SBI consultants made a difference in the performance of new ventures while SBDC

Table 1

Outside Resources and Firm Performance: The Use of Outside Consultants

TYPE OF RESOURCE	SAMPLE	PERFORMANCE-RELATED RESULTS	REFERENCE
OUTSIDE CONSULTING			
Business consulting; especially help with sales, promotion, and marketing research	22 new ventures; 11 receiving SBI assistance and 11 receiving SBDC assistance	Six of 11 SBI clients reported improvements in gross sales, efficiency, cash flow and overhead as a result of assistance. No SBDC clients reported improvements.	Hoy, 1982
SBDC assisted outsider based strategic planning	101 SBDC-assisted firms; two control groups (101 and 61 firms) which did not receive assistance	SBDC-assisted firms were more profitable and effective (growth, productivity, employment) than controls.	Robinson, 1982
Non-specified SBI consulting assistance	166 clients from SBI case files from ten federal regional offices	SBI assisted small firms increased in employment, sales, and profits over national averages for comparable small businesses.	Solomon & Weaver, 1983

Table 1 (continued)

TYPE OF RESOURCE	SAMPLE	PERFORMANCE-RELATED RESULTS	REFERENCE
OUTSIDE CONSULTING			
SBDC assisted outsider-based strategic planning	51 SBDC-assisted firms in GA	No differences in impact of strategic planning on effectiveness (sales growth, profitability, sales per employee, employment) were found between three stages of development (startup, early growth, late growth).	Robinson, Pearce, Vozikis & Mescon, 1984
SBDC provided in-depth counseling with accounting, financial, working capital, work flow, and marketing problems	84 small businesses in GA and 19 in SC from 1980-1981	Small business receiving counseling bettered the average firm in the state, measured as average percent changes in sales and employment.	Chrisman, Nelson, Hoy & Robinson, 1984
SBDC provided assistance	766 small businesses in IA from 1981-1983	Average businesses with counseling had small net increases in employees and sales over average Iowa firm.	Pelham, 1985

Table 1 (continued)

TYPE OF RESOURCE	SAMPLE	PERFORMANCE-RELATED RESULTS	REFERENCE
OUTSIDE CONSULTING			
Assistance in market feasibility, product redesign,market research and strategy, venture and financial planning	63 student projects in a univsity based new venture development office; 50 ventures(pre-start, early startup, or major expansion)	The average assisted firm saved 5.38 months, valued at $6097. Assistance was valued at $37,000. Firms gained 20 employees and raised $5.1 million in capital.	McMullin, Long & Graham 1986
SBDC consulting (marketing research, feasibility, strategic planing, etc.)	104 pre-venture clients in GA and 80 in SC	Clients had greater than expected number of business starts and higher rates of survival.	Chrisman, Hoy & Robinson 1987
Outside sources of information	634 new business owners	Growth firms relied more heavily on information from outside accountants/bookkeepers than declining firms.	Dunkelberg, Cooper, Woo & Dennis, 1987

Table 1 (continued)

TYPE OF RESOURCE	SAMPLE	PERFORMANCE-RELATED RESULTS	REFERENCE
OUTSIDE CONSULTING			
SBDC consulting services for strategic, administrative, and operating problems	76 owners or managers requesting SBDC assistance	A direct, positive correlation existed between extent of assistance and return on sales. A negative correlation existed between extent of assistance and sales growth for firms with administrative and operating help. No relation existed between extent of assistance and sales growth for firms receiving assistance with strategy.	Chrisman & Leslie 1988
SBDC assistance in planning, accounting, finance, and marketing	106 SBDC clients in UT	Managers perceived that consulting had a positive or no effect in all areas. Managers never perceived that consulting had a negative effect.	Nahavandi & Chesteen, 1988

Table 1 (continued)

TYPE OF RESOURCE	SAMPLE	PERFORMANCE-RELATED RESULTS	REFERENCE
OUTSIDE CONSULTING			
SBDC provided strategic, operating and administrative assistance	123 pre-venture clients that received 12 or more hours of consulting	Clients perceived that strategic assistance was more valuable than operating or administrative assistance.	Chrisman, 1989

consultants did not. He found that six of 11 SBI-assisted new ventures reported improvements in profits, gross sales, efficiency, cash flow, and overhead costs whereas none of the 11 SBDC-assisted new ventures reported such improvements.

Robinson (1982) studied the value of outside strategic planners for small firms. The strength of this study lies in its use of two different control groups with a sample size of 263. The sample included 101 firms which received in-depth assistance in strategic planning from experienced staff consultants at the University of Georgia's SBDC. One control group consisted of 101 firms from the 1978 RMA Annual Statement Studies which had been matched with the SBDC sample firms by type of business and annual sales. The other control group was a random sample of 61 firms from the files of a northeast Georgia bookkeeping service. These firms were similar to the SBDC firms in type of business, annual sales, and number of employees. In addition, Robinson determined that the pre-planning profitability of the SBDC firms and the control groups were not significantly different.

Robinson found that the SBDC firms were significantly more profitable during the post-consulting period than the RMA control group. Using a multi-variate measure of organizational effectiveness which included sales, return on sales, employee growth, and productivity, he found that

the SBDC firms were significantly more effective than the control firms from the bookkeeping service.

Solomon and Weaver (1983) studied 166 SBI-assisted small firms. They found that the SBI-assisted firms increased in employment, gross sales, net profits, net worth, and owner's compensation more than comparable small firms which received no assistance.

In a study of SBI-assisted firms, Robinson, Pearce, Vozikis, and Mescon (1984) compared the impact of strategic planning on firm performance among firms at three different stages of development: startup, early growth, and late growth. They found that no differences existed in performance between the SBI firms at the three different stages.

Chrisman, Nelson, Hoy, and Robinson (1985) studied 84 small businesses in Georgia and 19 in South Carolina that had received in-depth SBDC counseling. They compared the post-counseling performance of these firms with other firms in both states and found that the SBDC assisted firms had increased sales and number of employees.

Pelham (1985) did a study similar to that of Chrisman and his colleagues. He sampled firms which had received SBDC counseling in Iowa. When compared to the SBDC firms in Georgia and South Carolina, the Iowa firms showed similar, but less dramatic, increases in sales and number of employees.

A study of McMullin, Long, and Graham (1986) found that outside consulting saved time for new ventures. Part-time M. B. A. students, who were experienced middle managers, provided assistance to 50 innovative new ventures. This assistance took place in 63 student projects involving market feasibility, product redesign, marketing research, marketing strategy, venture planning, and financial planning. Venture managers who received this outside assistance estimated that the assistance saved them an average of 5.38 months valued at over $6,000. The 50 new ventures also gained a net of 20 employees and raised over five million dollars in capital, both of which venture managers attributed to the outside help. An estimation of the value of the projects was set at over $37,000 per firm.

A study of 184 pre-venture clients in Georgia and South Carolina found that clients utilizing consulting services of local SBDCs started a higher than expected number of new businesses. These businesses also had higher than expected survival rates (Chrisman, Hoy & Robinson, 1987).

Unlike most of the studies cited above, Dunkelberg, Cooper, Woo, and Dennis (1987) looked at the impact of assistance from outside accountants and bookkeepers. The researchers found that growth firms, in a sample of 643 new businesses, relied more heavily on information from

these outside sources than firms which were experiencing declines in performance.

Another study of the effectiveness of SBDC consulting found that, for 76 small businesses, a direct and positive correlation existed between the extent of assistance with operating and administrative problems and return on sales, but no correlation existed between assistance with strategic planning and sales growth (Chrisman & Leslie, 1988). This later finding is in contrast to the value ascribed to outsider-based strategic planning by Robinson (1982). Chrisman and Leslie noted this discrepancy and commented that not enough time may have lapsed between the assistance and the measurement of its impact.

Two recent studies have examined small business managers' perceptions of the value of SBDC consulting. Nahavandi and Chesteen (1988) reported that managers perceived the assistance they received in planning, accounting, finance, and marketing to have positive or neutral value; in no instances did managers perceive that the outside consulting hurt business performance. Chrisman (1989) founded that SBDC clients valued assistance with strategic planning more highly than assistance in administration or operations.

In general, these studies support the position that the use of outside consultants improves firm performance. In most of the studies, firms which used outside

consultants had post-consulting improvements in firm profitability and growth. Robinson's (1982) findings are particularly compelling, but many of the other studies cited lend support to the positive relationship between the use of outside consultants and improved firm performance. The differences that exist between the studies may be attributed to variance in the quality, extensiveness, and depth of the consulting, as well as the length of time which lapsed between the consulting and the research study.

The findings of McMullin, Long, and Graham (1982) demonstrate that entrepreneurs believed that outside assistance saved time for new ventures. This time-saving aspect of the use of outside resources will be explored more completely later in this paper.

3. NEW BUSINESS INCUBATORS

By definition, a new business incubator is a facility designed to hatch or develop fledgling businesses under controlled conditions (Allen, 1985). A new business incubator is usually a multi-tenant facility designed to provide resources to help overcome the problems and obstacles faced by new ventures. Business incubators seek to graduate sound and growing firms.

As of 1987, over 200 new business incubators have operated in the United States (Merrifield, 1987). Many of these facilities are relatively new. A 1986 study of 50 incubators in 28 different states indicated that 89% of these had been started since 1983 (Smilor & Gill, 1986), and a study of 22 incubators indicated that, as of 1985, 87% had opened since 1980 (Gatewood, et al., 1985).

The kinds of resources provided by the incubator facilities vary, but generally fall into four major categories: secretarial support, administrative assistance, facilities support, and business expertise. These resources are often provided at reduced or no cost to the new businesses which go through a screening process to become part of the incubator program.

Why Incubator Membership Should Help New Businesses

According to Smilor and Gill, "The process of 'hatching' new businesses, of incubating emerging enterprises, seeks to speed company growth and provide an innovative approach to economic development" (1986: 1). Incubators are designed to provide experience to inexperienced entrepreneurs (Bauman, 1981). The benefits to tenant companies include developing credibility for the firm, providing access to business networks, speeding up problem solving, and shortening the firm's learning curve (Smilor & Gill, 1986). It is these two latter benefits

that are of most interest here. Faster problem solving and a shortened learning curve should speed up company growth.

Incubators can help tenants solve problems faster because the incubator staff is able to focus on the right problem, locate assistance, and participate in the implementation. Since the life cycle of a new technology is now estimated to be 18 months, time is particularly critical to those companies trying to commercialize a new technology (Smilor & Gill, 1986).

Furthermore, learning to run a company can take a long time, and many new venture managers do not have time to learn the hard way. They can benefit from the experience of others:

> Incubators can help accelerate the learning process. They can condense experience. Through entrepreneurial education, the management of tenant companies can tap the know-how of more knowledgeable and experienced business people. In the process they can shorten their own learning curve (Smilor & Gill, 1986: 38)

Empirical Studies on New Business Incubators

Research on the impact of new business incubators on business development and the commercialization of new technologies is mostly descriptive in nature. This research generally catalogues the kinds of services provided by incubators, the value attached to these

services by entrepreneurs, the factors that lead to the success of incubator programs, and the key benefits to tenants.

Research on the performance of incubator tenants, which is of major interest here, is preliminary and limited. The performance of incubator tenants has been primarily measured as sales revenues and number of employees, as growth in revenues and employees, and as graduation and survival rates. Many of these variables are dependent on the age of the incubator and the age of the tenant firms; and, as noted above, most incubators are young organizations. Empirical studies which measured the performance of incubator tenants are summarized in Table 2 and discussed below.

Brown (1982), Allen (1985), and Smilor and Gill (1986) were concerned with how many tenants had graduated from incubators and survived after graduation. Brown (1982) found that six of the eight tenants of the Utah Innovation Center had graduated and survived. Allen (1985) reported that 44% of 39 incubators had graduated no firms and 46% had graduated five or fewer firms. Smilor and Gill (1986) found that 30 of the 211 firms had graduated from the 50 incubators in the study.

Two other studies were concerned with some of the benefits of incubator membership. Gatewood and her co-authors (1985) determined that incubator tenants had

Table 2

Outside Resources and Firm Performance: New Business Incubators

TYPE OF RESOURCE	SAMPLE	PERFORMANCE-RELATED RESULTS	REFERENCES
SMALL BUSINESS INCUBATORS			
Shared facilities and resources including office and laboratory space, secretarial, legal, technical and management services	New ventures associated with the Utah Innovation Center	After two and one-half years, six of the eight companies were operating, none old enough to call successful but several show promise.	Brown, 1982
Logistical and physical service (custodial, lunch room, etc.); shared business support services (clerical, receptionist, etc.); business consulting	39 business incubators and their 850 tenants operating in 1984-1985	Forty-four percent of incubators had no firms graduate, and 46% had five or fewer firms more out due to success. Thirty-nine percent of tenants had no sales and 15% had sales over $100,000 for that quarter.	Allen, 1985

Table 2 (continued)

TYPE OF RESOURCE	SAMPLE	PERFORMANCE-RELATED RESULTS	REFERENCES
SMALL BUSINESS INCUBATORS			
Financial, managerial, general business, professional business assistance and physical services (cafeteria, building security, etc.)	12 incubators in PA and their 56 tenants operating in 1984	Incubator influenced change in strategy for 54% of firms, allowed more rapid growth in 22%, increased contacts in 15% and lowered costs in 12%.	Allen & Rahman, 1985
Unspecified services and facilities	22 incubators identified by Small Business Administration	Failure rates of tenants were less than one-half that of the sample population.	Gate-wood, Ogden & Hoy, 1985
Four categories: secretarial, administrative, business and professional consulting, and facilities	50 incubators in 28 states and their 211 tenants	Thirty of 211 companies graduated from incubators; 31% of graduates remained less than 1 year; 45% stay-ed 1-2 years; 44% of tenants had 1-2 employees; and 54% had sales less than $200,000.	Smilor & Gill, 1986

failure rates less than one-half that of all new firms. Allen and Raman (1985) concluded that incubators influenced strategy changes, allowed for more rapid growth, increased business contacts, and lowered costs for tenants.

The question of whether supplying low cost facilities and administrative, business, and technical support leads to new venture success has yet to be answered in a definitive manner. Researchers are beginning to look at the performance of incubator programs in terms of number of jobs created, success/failure rates of tenants, and profitability of tenants; but many incubators have been operating too short a time to evaluate their effect on firm performance and economic development.

4. MEASURING PERFORMANCE IN NEW FIRMS

Measurement of organizational performance is "perhaps one of the thorniest issues confronting the academic researcher today" (Venkatraman & Ramanujam, 1986: 801). The limitations of both financial and market share measures of firm performance are widely discussed in strategic management (e.g., Chakravarthy, 1986; Woo & Willard, 1983). Similarly, organizational theorists have wrestled with the issue of organizational effectiveness (e.g., Jobson & Schneck, 1982; Lewin & Minton, 1986).

Special characteristics of new organizations make measuring performance even more complicated. Return on investment (ROI) is always problematic as a performance measure because of its sensitivity to accounting practices. The problems are exaggerated in new ventures by the "tremendous range and variability of ROI found in virtually any group of new ventures" (Miller, Wilson & Adams 1988: 298) and by the susceptibility of the new firm's small accounting numbers to changes in accounting practices. In addition, since independent new ventures have been found to take on an average of three to four years to break even (Fast, 1981; Weiss, 1981), improvements in ROI can look impressive while actual ROI is still negative.

Measuring new business performance on the basis of growth rates can also be misleading. Growth calculations are always determined as percent changes, based on the previous year. If the number in the previous year is very small, even small increases can result in impressive growth rates. Consider a firm with two employees in year one which adds one employee in year two. This results in a growth rate of 50%. Compare this to adding one employee to a firm that has 100 employees. In this instance, the growth rate is 1%. Initially even a small addition in the absolute number of employees or sales of a new business will result in an impressive growth rate which may be more

indicative of the firm's initial size than its performance.

Market share measures of new venture performance also present difficulties. The first entrant in a new market initially has a market share of 100%. Successful development of this new market attracts competitors who take some market share away from the first entrant. As a consequence, the first entrant's success can result in a loss of market share (Miller, et al., 1988).

Since performance in new ventures is difficult to measure and leads to counter-intuitive and often erroneous conclusions, perhaps new ventures should be evaluated in terms of progress toward goals rather than initial success or failure in achieving these goals. The achievement of goals may be a more appropriate measure of new firm performance since there is so much variability in the actual performance of new firms as well as so much uncertainty on how to measure this performance. Measuring new venture performance as progress toward goals is relatively unusual, but this method has been used in two studies.

Van de Ven, Hudson, and Schroeder (1984), in a study of 14 educational software development companies, separated firms into high and low performing groups based on both objective and subjective criteria. They found that all low performing firms were in an early stage of

development and that all high performing firms were in a later stage of development. Stage of development was used as a measure of firm performance. Firms that had progressed beyond an early contract service stage toward the goals of later proprietary product and a multiproduct stages were more successful firms.

Miller, Wilson, and Adams (1988) used progress toward goals as a measure of firm performance in a study of 124 new ventures in the PIMS data base. They developed the measure, V, which tracks the firm's improvement in some financial measure (its velocity) adjusted for the variability of that improvement. V measures the rate of progress toward some financial goal adjusted for the uncertainty surrounding that progress.

Neither stage of development nor velocity is an appropriate measure for the current study. Van de Ven and his co-authors were able to use stage of development since all the sample firms were in the same industry. The firms in this study are in several industries, each of which could be characterized by different stages of development. Velocity cannot be used here either as it requires a minimum of three to four years of data. Such longitudinal data is unavailable; a number of the sample firms are less than three years old.

Measuring New Venture Performance with Milestones

Block and MacMillan (1985) have suggested that starting a new business is really an experiment whose underlying assumptions about its feasibility need to be tested occasionally. Milestones are significant events which allow the entrepreneur to evaluate the venture's progress toward goals and to re-evaluate assumptions. Certainly, evaluating new venture performance in terms of milestone achievement is in keeping with Stevenson's observation that entrepreneurial firms commit resources in a multi-stage manner (Stevenson, et al., 1985). New resources are committed as milestones are achieved; and at each milestone, the new firm is able to re-evaluate its current viability and its chances for long term success. The time it takes a new firm to reach milestones will be used to measure performance in this study. Several milestones can be used to measure firm performance including time to first sale, time to first shipment, time to breakeven, time to positive cash flow, and time until the owner pays himself a salary.

The Importance of Time

Why is it important for a new firm to reach milestones as early as possible? One reason is that until a firm reaches the milestone of first sales, no return is possible on the investment of resources made by the firm.

In addition, marketing strategy suggests that only a limited time exists during which the competencies of the firm match the requirements of the market. These "strategic windows" are opportunities that present themselves for only a limited time (Abell, 1984) and often provide opportunities for profit enhancement,

> ...says John Hanley, an AT&T vice-president of product development, 'We came to the realization that if you get to market sooner with new technology, you can charge a premium price until the others follow.'(Dumaine, 1989: 57).

In addition, firms that are slow to market may find the window of opportunity has closed for them because market need no longer exists or competitors have arrived.

Miller, Gartner, and Wilson (1989) have shown that early market entrants garnered superior, sustainable market share as well as a competitive advantage over later entrants. It appears that reaching milestones early can have long term advantages for the new firm especially when those milestones represent success in the marketplace.

The "threshold concept" (Timmons, 1986) provides another reason why reaching milestones quickly is advantageous. A minimum size for a firm, both in terms of number of employees and sales revenue, appears to exist which greatly enhances the firm's chances for survival and growth. Data on failure rates for new firms show that the

one year survival rate for firms with nine or fewer employees is 77.8% whereas firms with 20 to 99 employees have a one year survival rate of 95.3%. The same trend holds for four year survival rates. Although sales revenue figures vary by industries, in general, the threshold for sales revenues appears to be a minimum of about $500,000 within four years,

> An inability to achieve sales over a half a million dollars within four years or so implies a business that is fragile and vulnerable to competition or one that is not focused on real opportunities (Timmons, 1986: 226).

Another reason why time is so critical in new firms, especially in technology-based firms, is that the transfer of technology to commercial application is time-dependent. Roberts (1970), in a study of technology-based firms, found that entrepreneurs who delayed starting a new business based on transferred technology paid a price for the delay. The longer the time between the entrepreneur's departure from his previous employer and the establishment of the new firm, the less technology was transferred. In some cases, less technology was transferred because some of it was forgotten as time passed. In other cases, the technology became obsolete before commercialization took place. In still other cases, the market had moved on, and the technology was no longer relevant.

5. STARTUP COMPLEXITY

Phenomena consisting of two or more interrelated parts are described as complex. Two forms of complexity, external and internal, have been discussed in the management literature. Domain complexity is a type of external complexity which has been defined as "the diversity and range of products, markets and geographic territories that decision makers choose for the organization" (Van de Ven & Ferry, 1980: 94). Organizations faced with complex domains develop more internal information processing systems and eventually segment the domain into homogeneous functions. A second type of external complexity, environmental complexity, is related to domain complexity. Duncan (1972) defined environmental complexity as the number of environmental factors a decision maker needs to consider multiplied by the degree to which each of these factors are dissimilar. These factors include the customer, supplier, and competitor components as well as socio-political and technological components in the environment.

Internal complexity is most often defined as the degree to which the formal structure of the organization is differentiated both vertically and horizontally (Price & Mueller, 1986). Organizational complexity often arises as a mechanism to deal with environmental complexity as

well as environmental turbulence. Mintzberg (1979) maintained that the environmental variables of complexity, stability, diversity, and hostility have a strong effect on organizational structure through the impact of the work related variables of comprehensibility, predictability, and diversity of the work as well as speed of response.

Starting a new business is recognized as complex, involving a number of interrelated tasks. In a study of the determinants of new venture performance, reseachers found that the "interactive effects of industry structure, strategy, and the entrepreneur had a greater impact on new venture performance than any of these variables in isolation" (Sandberg & Hofer, 1987: 5). They conclude, not surprisingly, that starting a new business is a complex process.

The definition of startup complexity developed here begins with the recognition that starting a business is made up of several interrelated tasks. Kazanjian (1988) has suggested that the startup tasks include developing production technology; refining product and technology designs; acquiring facilities and resources; producing, selling, and distributing the product; and acquiring human resources. These tasks can be broken down into finer units of activity; Vesper (1980) developed a list of 65 startup tasks.

The second component of startup complexity results from the recognition that the tasks involved in starting a business vary in difficulty from one firm to another. Startup complexity is defined as the number of tasks required to start a business weighted by the degree of difficulty of each of those tasks. A simple startup is one where a few simple tasks are required, and a complex startup is one where many difficult tasks are required.

For example, a one-person, home-based business startup providing computer support on a contract basis in a small local market is a relatively simply startup, even more simple if the founder already owns the necessary computer hardware. Here no employees are hired, no raw materials are needed, and no financing is required. The production process, writing computer programs, is based on skills already possessed by the founder. Marketing is fairly simple as the founder uses a word-of-mouth advertising strategy with his established network of personal friends and business associates.

On the other hand, consider a biotech startup with an undeveloped technology potentially useful in the pharmaceutical industry. First, financing is required for both laboratory space, equipment, supplies, and, ideally, some laboratory technicians. The technology needs to be developed into a viable product which must undergo extensive inhouse testing as well as testing by the

Federal and Drug Administration. Furthermore, the market needs to be educated about the uses and advantages of this product. Finally, the distribution channels may involve a personal sales staff making calls on individual physicians and hospitals. This startup is considerably more complex than the first example. Regardless of the manner in which the firms in the examples acquire resources, the complex biotech startup should take more time to reach milestones than the computer software firm.

Since complexity can impact the time it takes a firm to reach milestones, the research design must control for complexity before the impact of outsourcing can be measured. Startup complexity occurs, as in example two, when the firm has numerous, difficult tasks to perform. The complex startup has more tasks to perform, and this takes more time than a simple startup with fewer tasks. A complex startup also has more difficult tasks, and difficulty escalates the amount of time to perform the task and lengthens the time to milestones.

6. LINKING OUTSIDE RESOURCES AND TIME TO MILESTONES

Two rationales are presented to explain why using outside resources should allow firms to reach performance milestones in less time. Briefly, firm milestones are reached earlier by using outside resources because the

firm is able (1) to operate with less capital than if all resources were owned by the firm and (2) to take advantage of the experience of others. Both of these activities save time for the entrepreneur. In the first instance, entrepreneurs who needs less capital are less likely to spend excess time raising funds. In the second instance, entrepreneurs can learn from the experience of others and shorten their own learning curve (Smilor & Gill, 1985). Both of these issues are addressed more completely below.

Inefficient Capital Markets for Entrepreneurs

Using outside resources can reduce the entrepreneur's need to raise capital. Entrepreneurs can raise equity capital in informal and formal venture capital markets. Informal venture capital markets are made up of individuals who are willing to invest in new businesses, whereas formal venture capital markets are comprised of venture capital companies, corporations, or partnerships which operate as investment groups.

Informal venture capital markets are inefficient. Information about investors and investments is difficult to locate. While formal venture capital networks do provide venture capital groups with information, informal venture capitalists and entrepreneurs must rely on business associates, friends, and their own personal

search for information about investments and investors (Bygrave, 1988; Bygrave & Timmons, 1986; Wetzel, 1987).

Venture capital is difficult to locate for other reasons as well. Formal venture capital markets are small; and while informal markets may be larger, they are essentially invisible (Haar, Starr & MacMillan, 1988; Wetzel, 1981). Both types of markets are geographically constrained. Most individual investors make investments close to home, and formal venture capital markets are located in large cities (Bygrave, 1988; Wetzel, 1981).

In addition, several rounds of funding are typically required as a firm grows and changes. For a group of California firms, first time deals typically took six months; second and third round financing deals took three to four months longer (Bruno & Tyebjee, 1983; Bruno & Tyebjee, 1985). Bruno and Tyebjee have concluded:

> Founders should anticipate that the search for capital will require a substantial amount of their time. Moreover, the search will divert them from day-to-day management of their venture. This later development often has serious repercussions for day-to-day control of the enterprise (1985: 62).

Entrepreneurs who use outside resources can use their time operating their businesses, not seeking funds. Attention to operations should allow these entrepreneurs to reach firm milestones sooner than entrepreneurs whose

concern for ownership of resources cause time-consuming diversions seeking funds.

Shared Learning and Experience

Firms using outside resources obtain many of these resources in ways which allow them use the learning and experience of others. This practice saves time for the startup.

Learning curve theory was first developed to explain the decrease in man-hours needed to produce airplanes (Wright, 1936). In its early formulation, learning curve theory postulated time savings as learning increases, yet today learning curves generally show a decrease in cost (or price) as volume accumulates. The Boston Consulting Group (BCG) was instrumental in this reformulation. Many of the BCG learning curve studies found that in addition to decreased labor hours as production volume accumulated, total manufacturing costs decreased as well (Hedley, 1984).

Learning curve theory was expanded to experience curve theory which proposes that all value-added costs, not just manufacturing costs, decline systematically as cumulative volume increases (Montgomery & Day, 1985). The experience effect appears as people gain experience (the practice effect), as better ways of organizing work are

developed, and as equipment is used more productively due to workers becoming more familiar with its operation.

Experience effects have been demonstrated in petroleum refining (Hirshman, 1964), rice production (Fusfeld, 1973), plastic products, electronic components, the life insurance industry (Hedley, 1984), and "in a broad range of industries in many different countries" (Hedley, 1984: 151).

A new firm using the resources of another firm (outside resources) can benefit from the experience of the other firm and save time. A firm developing a resource inhouse is near the top of the experience curve. This position means that the firm will take more time to acquire the resource than if the resource was obtained from an experienced firm.

CHAPTER III

RESEARCH METHODOLOGY

1. BACKGROUND OF THE STUDY

This study was part of a larger study within the M. B. A. Center of Excellence for New Venture Analysis at the University of Tennessee and was sponsored, in part, by the Oak Ridge National Laboratory. This larger study had two major purposes: (1) tracking the contributions made by the federal facilities in Oak Ridge to the startup and development of new local businesses and (2) tracking the flow of resources to and within this population. The federal facilities in Oak Ridge include the Oak Ridge National Laboratory, the Gaseous Diffusion Plant, the Oak Ridge Y-12 Plant, and the Oak Ridge Office of the Department of Energy.

2. POPULATION

The two purposes of the study specify the population as local firms which had received resources from the federal facilities. Two criteria were used to define this population: (1) the firm had its origins in the Knoxville-Oak Ridge area, and (2) the firm had some relationship

with the federal facilities in Oak Ridge. These relationships could take many forms: the founder(s) could have been employed at, transferred technology from, or made use of resources at these facilities.

To uncover the entire population of interest, the researchers first consulted with experts familiar with both the federal facilities in Oak Ridge and local business development. These experts identified the businesses of interest. Next, the researchers reviewed the Tennessee Technology Foundation list of businesses in the Knoxville-Oak Ridge Technology Corridor to supplement the expert's list. The foundation's list includes only technology businesses, and these are the local businesses most likely to have relationships with the federal facilities. Firms whose places of origin or connections to the federal facilities were unknown were telephoned to determine if they fell within the domain of the population.

Seventy-two companies met the criteria. Six firms were founded during the 1950s, eight in the 1960s, 13 in the 1970s, and 45 in the 1980s.

The firms can be described as technology-based. All were founded by entrepreneurs who had college degrees in science or engineering. Many firms had multiple founders, and many founders had multiple degrees, so it is difficult to tabulate all the college degrees for all the founders.

Of the 32 founders who were interviewed, two had degrees in biology, five in chemistry, one in physics, one in computer science, and 23 in engineering. The founders of these 32 firms had a minimum of 14 Ph. D. degrees. All firms were established to exploit the technological knowledge, expertise, and experience of the founders. In every firm, technology played a major role in the products or services provided.

The firms are described as technology-based rather than high technology firms. High technology firms have been defined as those founded by "technically trained people, competing through emphasis on technological innovation, and participating in industries characterized by technological change" (Cooper, 1985: 155). Since all firms meet the first two, but not all three criteria, it is more appropriate to define the sample firms as technology-based rather than as high technology firms.

3. METHODS OF DATA COLLECTION AND SAMPLE

Data was collected using a mail survey and field interviews. Since this study was part of a larger one, not all the data collected from the mail questionnaires or the field interviews were used here.

The mail survey was designed using guidelines suggested by Dillman (1978). A copy of the questionnaire

can be found in Appendix A. The questionnaire and a cover letter, explaining the purpose of and encouraging participation in both phases of the study, were mailed to founders. Non-respondents were sent a second copy of the questionnaire and a new letter. Finally, the remaining non-respondents received telephone calls from members of the research team.

Fifty-two firms responded to the questionnaire for a response rate of 72%. These 52 firms were candidates for the interview process. Since the interviews would gather data about events in the first year of business, nine firms founded before 1970 were eliminated. The sample firms were all founded after 1974.

Eleven additional firms were also eliminated. Seven of those eliminated had founders unwilling to be interviewed. Two of those eliminated were no longer operating, and the founders could not be located. The last two firms were eliminated because they had achieved no major milestones through operations. These firms had made no sales, had shipped no product, and had no cash flow from operations. These firms did pay salaries to the principles, but out of invested capital, not operations. As such, payment of salaries to principles did not represent a milestone achieved but rather represented the capitalization of the firm.

Founders of the remaining 32 firms (44% of the originally identified population) were interviewed to obtain quantitative and qualitative data using structured and open-ended questions. (The interview schedule can be found in Appendix B.) One additional firm was eliminated as an outlier after preliminary statistics showed that it had taken more than four standard deviations longer than the average firm to reach first sales.

The open-ended questions were designed to provide a richer understanding of the process by which entrepreneurs acquire resources during the startup of their firms. The open-ended questions sought information about the history of the firm and solicited comments about why a resource was obtained through a particular set of transactions. Each interview was tape-recorded; then the information was transcribed and coded.

4. DEFINITION AND MEASUREMENT: OUTSIDE RESOURCES

The definition and measurement of outside resources involves several complex issues; all are discussed below. The first is that the phrase "using outside resources," as it appears in the literature, describes a range of activities. This implies that the variable is continuous, not categorical; yet the term "outside resources" has a

categorical connotation. This issue is discussed and resolved by renaming the concept Degree of Outsourcing.

The second issue concerns the measurement of Degree of Outsourcing. The literature provides a list of transactions which represent different degrees of outsourcing, and these transactions can be used to operationalize the concept. However, the transactions need to be ranked, and the intervals between the transactions need to be determined. To this end, the four dimensions of outsourcing (outside resources), discussed earlier, were used in a scaling study employing the Comfrey method of paired comparisons (Torgerson, 1958).

Finally, this study is not concerned with decisions about individual transactions but rather with the aggregate stream of decisions which determine the firm's strategic posture with regard to resource acquisition. This means that the individual transactions used to obtain a kind of resource, like marketing information, have to be aggregated into a global measure of Degree of Outsourcing.

From Outside Resources to Outsourcing

Using outside resources implies that some resources are acquired from outside the firm while others are acquired from within the firm. Furthermore, the literature, in providing examples of how firms use outside resources, describes a number of different transactions,

implying that outside resources are acquired in more than one way. Some of these ways include purchasing, renting, and borrowing. Add to this list the fact that resources can also be developed within the firm, and the possibilities now include developing inhouse, purchasing, renting, and borrowing.

The terminology "use of outside resources" fails to convey the fact that some resources are developed within the firm. On the other hand, using the terminology "outside resources and inside resources" implies a dichotomy which fails to include the range of transactions noted in the literature. Both sets of terms are weak and need to be discarded. The terminology was used until now to be consistent with the literature. However, the time has come to choose a term which more appropriately represents the variety of transactions used to acquire resources, both from inside and outside the firm. The phrase "Degree of Outsourcing" will be used to describe the range of transactions that entrepreneurs can use to acquire resources for their firms.

To help develop a definition of Degree of Outsourcing, consider an entrepreneur who wants to follow the advice that a high degree outsourcing can benefit his firm (Timmons, et al., 1985). He first must determine which transactions could be used to obtain the resource, and then he must decide how to rank these transactions to

determine which represents the highest degree of outsourcing. Both of these tasks are discussed below.

Set of Available Transactions

The literature provides some assistance in listing general transactions through which a firm could obtain equipment including inhouse development, purchases, rentals, loans, or gifts (Stevenson, et al., 1985; Timmons, et al., 1985). Since subcontracting the manufacturing function makes the acquisition of equipment unnecessary, subcontracting is also included in the set of transactions used to acquire equipment (Timmons, et al., 1985). In addition, the literature suggests that a firm could obtain information through transactions with employees and paid consultants as well as from licensing arrangements and free advice (Chrisman, et al., 1987; Hoy, 1982; Robinson, 1982; Stevenson, et al., 1985; Timmons, et al., 1985).

Since this is a relatively new area of study, six pilot interviews were used to verify and modify the set of transactions outlined above. The interviews confirmed that all of the transactions listed were possible choices but also revealed that some firms used inter-firm teaming to obtain information. Teaming occurred when firms joined together for project-long joint ventures. Firms wishing to undertake a project for which the requisite knowledge

was unavailable inside the firm would, on occasion, form a team with other companies. The multi-firm team worked together for the length of the project, sharing expenses and revenues. Teaming arrangements allowed firms to use information from outside the firm.

For this study, the final set of transactions for acquiring equipment included inhouse development, purchases, rentals, subcontracts, loans, and gifts. The set of transactions used to obtain information included inhouse development, paid consultants, teaming, licensing, and free advice.

Ranking the Transactions

Four dimensions concerning the use of outside resources or outsourcing were derived from the literature and described above. These dimensions include (1) the efficient utilization of the capacity of the resource, (2) the pattern of investment used to acquire the resource, (3) the duration of the contract used to acquire the resource, and (4) the extent of the drain on the firm's assets. These four dimensions provide the framework which allows the set of transactions used in this study to be ranked and for the term "Degree of Outsourcing" to be defined.

Figure 2 aligns each of the four dimensions with Degree of Outsourcing. Each dimension has two extremes;

the extreme right of each dimension represents the position that Stevenson, Timmons, and their co-authors recommend (Stevenson, et al., 1985; Timmons, et al., 1985). A firm whose resource acquisition strategy includes high capacity utilization, recurring expenses, short contracts, and a minimal drain on firm assets uses a high degree of outsourcing. On the other hand, a firm has a low degree of outsourcing when the acquired resource's capacity is greatly under-utilized, when the resource is acquired totally through a single capital investment, when the duration of the contract is maximized, and when the acquisition consumes all of the available assets of the firm. This position is represented on the extreme left of all dimensions.

The transactions through which a firm acquires resources can be mapped on the dimensions in Figure 2. For example, inhouse development is characterized by low capacity utilization (as excess capacity is likely to occur), high initial capital expenditures for development equipment, recurring periodic expenses for salaries of R&D employees with whom the firm has long-term implied contracts, and a significant drain on the firm's assets. Inhouse development represents an extremely low degree of outsourcing.

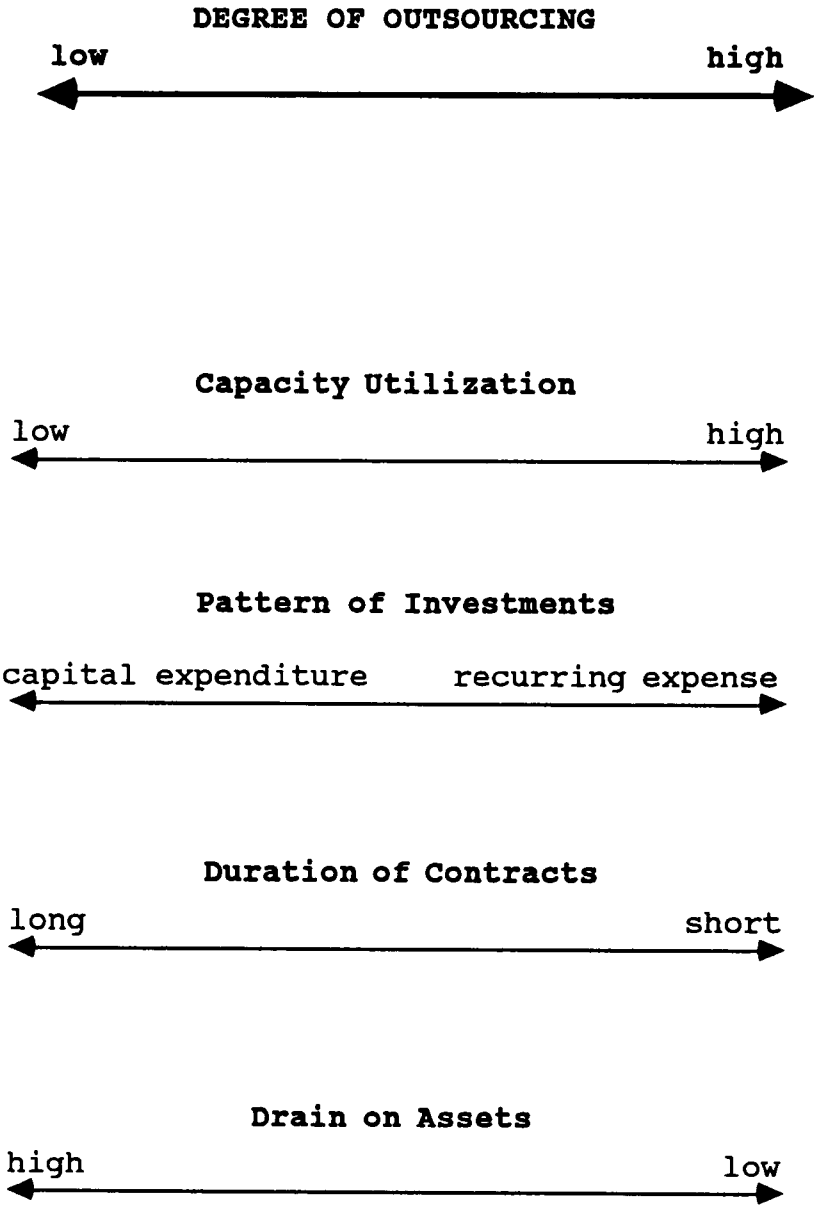


Figure 2

Relationship Between Degree of Outsourcing and the Four Dimensions

Purchases represent an intermediate degree of outsourcing. Contract duration is shorter (no R&D employees are needed), and high initial capital expenditures can be reduced through mortgages. Also, with purchases, the more certain final cost of the resource can be spread out over a longer period to reduce current asset drain.

Renting represents a high degree of outsourcing as the firm is more able to match the capacity of the resource with that needed. In addition, renting means that the investment pattern can be incremental and spread over a long period to reduce the current drain on the firm's assets.

A similar logic can be used to show how a firm which needs information can engage in transactions that represent different degrees of outsourcing. Here the degree of outsourcing depends on the kinds of people from whom the firm obtains information. Again, the four dimensions in Figure 2 help distinguish between those degrees of outsourcing.

Consider a firm that needs legal advice. The firm could hire an attorney to staff a position within the firm. It is unlikely that a new, small firm could utilize the full services of an inhouse attorney (a low utilization of capacity). The firm would have a long term implied employment contract with the attorney, and the

salary expenditure would cause a regular drain on the firm's assets. Given a new firm with few sales, the attorney's salary could represent a considerable drain on the firm's assets. This firm's resource strategy represents a low degree of outsourcing.

The same firm could hire an outside attorney on an as-needed basis. Here the firm matches its need for legal information with an appropriate amount of legal advise by using the attorney's services only when actually needed (high capacity utilization). In addition, the firm has a short term contract with the attorney, and the intermittent payments to the attorney would represent less drain on the firm's assets than the regular salary of an inhouse attorney. This firm's strategy represents an intermediate degree of outsourcing.

The firm may have another option if, for example, a principle in the firm has a sister who is a lawyer willing to give the fledgling firm some free advice. As with the attorney hired as-needed, capacity and need are well matched in this arrangement as the firm gets only the legal advice it needs. There is no contract with the sister, representing the shortest contract duration possible; and there is no drain on the assets of the firm. The firm's strategy represents a high degree of outsourcing.

The actual rankings of the transactions and the scale differences between the transactions were obtained from a scaling study. This study is described below after Degree of Outsourcing is defined.

Definition of Degree of Outsourcing

Degree of Outsourcing is defined in terms of the four dimensions: (1) utilization of the capacity of the resource, (2) the pattern of investment made in the pursuit of the opportunity, (3) the duration of the contract to acquire the resource, and (4) the magnitude of the drain on the firm's assets. Firms with positions on the right side of the dimensions in Figure 2 have high degrees of outsourcing. Firms with positions on the left side of the dimensions in Figure 2 have low degrees of outsourcing.

Measurement of Degree of Outsourcing

Six transactions, obtained from the literature and confirmed in the pilot interviews, formed the basis for the measurement of Degree of Outsourcing for equipment. These transactions are developing inhouse, purchasing, renting, sub-contracting, and obtaining loans or gifts. These six transactions form a six point scale which was used to measure the Degree of Outsourcing for equipment.

Five transactions, obtained from the literature and the pilot interviews, formed the basis for the measurement of Degree of Outsourcing for information. These transactions are developing inhouse, paying consultants, teaming, licensing, and obtaining free advice. These five transactions form a five point scale for Degree of Outsourcing for business and technical information.

The scaling study. Two tasks were required here. The first was to rank order the transactions in each set. Since there was no reason to assume that an equal interval exists between each pair of transactions, the second task was to determine an appropriate interval between each pair of rank-ordered transactions. The Comfrey method (Torgerson, 1958) of paired comparisons was used in the scaling study since this method can do both tasks.

The scaling study was conducted using twelve strategic management faculty members and doctoral students at the University of Tennessee. Respondents were asked to compare every possible pair of transactions and to judge how well one transaction, when compared with its mate, allowed an entrepreneur to match capacity with need, use a recurring expense, chose the shortest possible contract duration, and minimize the drain on the firm's assets. The instrument used in the scaling study can be found in Appendix C.

For each pair of transactions, a direct estimate is obtained for the ratio of one transaction to the other. The other observations yield additional indirect estimations of this ratio. In all, the Comfrey method results in one direct estimate and five (or four for information transactions) indirect estimates of the ratio of a transaction to each of the others for every respondent in the study. This results in 72 estimates (60 for information) for each ratio. These values were averaged and resulted in a scale value for each transaction. The scale values are summarized in Table 3.

Figure 3 shows the ranking of each transaction used to obtain equipment as well as how these transactions correspond to differing degrees of outsourcing. Transactions like developing inhouse and purchasing represent a low degree of outsourcing based on the scale values. Subcontracting and renting represent intermediate degrees of outsourcing. Loans and gifts represent the highest degree of outsourcing. The scale values have no absolute meaning; they represent relative positions of each of the transactions to the others.

Figure 4 shows the ranking of each transaction used to obtain information as well as how these transactions correspond to differing degrees of outsourcing. Information from consultants or developed inhouse represent a low degree of outsourcing based on the scale

Table 3

Scale Values for Transactions

Resource and Transaction	Scale Value
Equipment	
Develop inhouse	0.35
Purchase	0.41
Sub-contract	0.79
Rent	0.87
Loan	2.56
Gift	3.85
Information	
Paid consultant	0.62
Develop inhouse	0.65
Licensing	0.70
Teaming	0.82
Free advice	4.32

TRANSACTION	SCALE VALUE	DEGREE OF OUTSOURCING
Develop inhouse	0.35	low
Purchase	0.41	
Subcontract	0.79	
Rent	0.87	
Loan	2.56	
Gift	3.85	high

Figure 3

Ranking of Transactions for Equipment

TRANSACTION	SCALE VALUE	DEGREE OF OUTSOURCING
Paid consultant	0.62	low
Develop inhouse	0.65	
Licensing	0.70	
Teaming	0.82	
Free advice	4.32	high

Figure 4

Ranking of Transactions for Information

values. Licensing and teaming represent somewhat lower degrees of outsourcing. Free advice represents the highest degree of outsourcing.

Scale values for each transaction for each of the 12 respondents in the scaling study were used to determine if the scale values were statistically different from each other. The scores of each respondent were compared using t-tests. For the transactions used to obtain information, inhouse development and consultants were not statistically different ($p = 0.193$), and teaming and licensing were not statistically distinct ($p = 0.507$). All other transactions were statistically different from each other ($p < 0.05$). For the transactions used to obtain equipment, developing inhouse and purchasing were not statistically different from each other ($p = 0.280$) nor were renting and subcontracting ($p = 0.118$), All the other transactions used to obtain equipment were statistically distinct from each other ($p < 0.01$).

In a test of inter-rater reliability, the average corrrelation among respondents was 0.95 for the information scale and 0.75 for the equipment scale. The values indicate that there was strong agreement among the respondents in the scaling study.

A global measure of outsourcing. The scale values were used to obtain a global measure of the degree of

outsourcing used by the firm to obtain resources, including R&D and production equipment, technical information, marketing information, financial information, and general management information. For each type of resource, the respondent was asked what percentage had been obtained using each of the transactions listed in Table 3 for that category of resource. For example, the respondent was asked: If you could aggregate all the technological information that was important to your firm during the first year, what percentage would you say came from each of the following categories: inhouse development, paid consultant, teaming, licensing, and free advice? Questions 1300 to 1394 of the interview schedule found in Appendix B lists the questions designed to obtain the data which was used to calculate a Degree of Outsourcing score for each category of resource.

The Degree of Outsourcing score was calculated as a weighted sum. The percent of a resource that was obtained through each of the transactions was weighted by the scale value for that transaction and added to the weighted percentages for each of the other transactions. A global score for Degree of Outsourcing was obtained using the following equation (Equation 3.1):

$$DO = B_1X_1 + B_2X_2 + B_3X_3 + B_4X_4 + B_5X_5 + B_6X_6$$

where (for equipment):

DO = Degree of Outsourcing
B_1 = percent of equipment developed inhouse
X_1 = scale value for inhouse development (0.35)
B_2 = percent of equipment purchased
X_2 = scale value for purchase (0.41)
B_3 = percent manufacturing subcontracted
X_3 = scale value for subcontract (0.79)
B_4 = percent of equipment rented
X_4 = scale value for rent (0.87)
B_5 = percent of equipment obtained as loans
X_5 = scale value for loan (2.56)
B_6 = percent of equipment obtained as gifts
X_6 = scale value for gift (3.85)

For example, consider a firm that responded that it had obtained 45% of its equipment from inhouse development, 25% from purchases, 20% from renting, and 10% from loans. A global measure of the degree of outsourcing used by this firm in obtaining equipment is calculated as below.

Degree of Outsourcing = (45 X 0.35) + (25 X 0.41) + (20 X 0.87) + (10 X 2.56) = 69

5. DEFINITION AND MEASUREMENT: TIME TO MILESTONES

Definition: Time to Milestones

Time to milestones is defined as the time from the startup of the firm until a performance milestone is

reached. Several milestones are possible. Each is discussed briefly below.

Time to First Sale. Time to First Sale is a measure of how long it takes to pass the first market test of a firm's products or services.

Time to First Shipment. Time to First Shipment is used as a measure of production efficiency.

Time to Breakeven. Since achieving a first sale and making the first shipment does not guarantee that the firm will be able to achieve repeat sales nor that the firm will achieve high enough sales to cover costs, Time to Breakeven is a measure of both effective marketing and efficient cost control.

Time to Positive Cash Flow. Since businesses operate on cash, not profits, Time to Positive Cash Flow could be included as an important milestone.

Time To Salary. Principles in a new startup often forego drawing a salary from the business during its early stage. This practice helps lower expenses and often improves the cash flow position of the firm. For firms that have generated revenues from operations, the length

of time before the principles begin taking salaries can be a indication of how well the firm is doing. Firms generating enough revenues to pay all the expenses of the business including the owners' salaries have achieved a performance milestone beyond that of firms with revenues insufficient to pay the owners' salaries.

Actual Milestones Used

While theoretically all of the milestones listed above could be used, not all could be used in practice. Some variables posed measurement problems in the sample firms. Since over one-fourth of the sample firms had yet to breakeven or to pay the founder a salary, neither of these variables could be used. Furthermore, since the cash flow of the firms was so erratic, it was impossible to determine when a firm was able to sustain a positive cash flow. So this measure was eliminated. Time to First Sale and Time to First Shipment were used in the analysis.

The Date of Firm Startup

Since time to milestones was measured from the time a firm was established, it was essential to define when the organization came into being. Starting a new firm begins with a business idea which becomes an organizational reality at a later time. It is difficult to determine

exactly when the ideas and intentions of the entrepreneur become an organizational reality.

For example, consider an engineer who wants to start a business. He thinks he can design a product for which a market exists. He spends time developing a prototype, gathering information about the market, and making inquiries about financing. The engineer has both ideas and intentions about starting a firm; he has gathered some information and invested time and resources in a prototype of the product. Does the business exist? If it does exist, at what point in time did it come into existence? If it does not exist, what must the engineer do to bring it into existence?

The field of entrepreneurship has characterized this progression from ideas and intentions to organization existence and development by stage of growth models (e.g., Cooper, 1979; Kazajian, 1988; Van de Ven, et al., 1984). All of these models depict a pre-organizational stage and a post-organizational stage with a clear demarcation between these stages labelled "startup." Yet the question remains: When does the organization begin?

Katz and Gartner (1988) have provided some help in answering this question. They have identified four characteristics of organizations, both those in existence and those in creation, which will be used here to establish the time when the organization begins. These

characteristics include resources, boundary, intentionality, and exchange. Resources are physical assets of the firm. Boundary is the establishment of the identity of the organization apart from the identity of the entrepreneur. Intentionality describes the entrepreneur's gathering of information in order to establish an organization. Finally, exchange is defined as transactions which occur either across the organization's subsystems or with external individuals and organizations.

Katz and Gartner (1988) do not chronologically order these four characteristics of organizations, suggesting that some properties of organizations emerge before others. Yet it appears that boundary implies the existence of the other properties to at least some degree. Katz and Gartner have suggested that the practical manifestations of boundary occur when the organization incorporates, requests a tax number, has a telephone listing, a name, or an address.

Consider an organization with a telephone listing in its own name; surely some intentionality has been established, the organization has some resources, and some exchange has occurred (with the phone company). For this reason, the establishment of boundary will be used here to define the beginning of the organization. An organization moves from organization-in-creation to organization-in-

existence (Katz & Gartner, 1988) when boundary has been established.

Katz and Gartner's examples of the activities a firm engages in to establish boundary were used to determine the date of the firm's "birthday." This date provided the starting point from which Time to Milestones was measured. The firm was considered to exist after any three of the following four events occurred: the firm acquired a name, an address other than the founder's home address, a telephone number other than the founder's home telephone number, or had applied for a tax identification number. The date when the third event occurred was taken as the day of the firm's "birth."

While each individual event is a not a strong measure of boundary, after three of the four have occurred, the firm should have an identity sufficiently apart from that of the founder to say that an organization exists. Items 1700-1703 of the interview questionnaire (Appendix B) were used to acquire the month and year of each of the four means of identification.

Measurement of Time to Milestones

Time to Milestones was measured by the number of months from the date of the establishment of the firm to the date of the milestone. Questions 1704 - 1708 of the interview schedule found in Appendix B were used to

determine the month and the year when each milestone was reached.

6. DEFINITION AND MEASUREMENT: STARTUP COMPLEXITY

Startup complexity was defined as the number of tasks performed in establishing a firm, adjusted for the difficulty of each of those tasks. There is discrepency in the literature about the number of tasks involved in starting a company. Vesper (1980) listed 65 tasks whereas Kazanjian (1988) listed seven. The differences depend mainly on the degree to which individual activities are aggegated into tasks. In the interest of parmsimony, a slight modification of Kazanjian's list was used in this study. The tasks included (1) hiring and retaining employees, (2) designing or developing products or services, (3) distributing, (4) marketing, (5) producing products or services, (6) acquiring raw materials, (7) financing, and (8) acquiring technology.
Respondents were asked to indicate which of these tasks they performed in starting their firms and to rate how difficult each of these tasks was on a scale of one to five, with one being the least difficult. Questions 308 - 315 of the questionnaire in Appendix A were used to gather data on this variable.

Two aggregate measures of startup complexity were developed. In method one, each task was multiplied by its degree of difficulty and added to each of the other tasks multiplied by its degree of difficulty. Equation 3.2 below was used in method one:

$$\text{Complex} = T_1D_1 + T_2D_2 + T_3D_3 + T_4D_4 + T_5D_5 + T_6D_6 + T_7D_7 + T_8D_8$$

where:

T_1 = the task of hiring and retaining employees

T2 = the task of designing or developing products or services

T_3 = the task of distribution

T_4 = the task of marketing

T_5 = the task of producing products or services

T_6 = the task of acquiring raw materials

T_7 = the task of financing

T_8 = the task of acquiring technology

D_1 - D_8 = the difficult of each of the tasks

In method two, each task was multiplied by the square of the degree of its difficulty and added to each of the other tasks multiplied by its degree of difficulty squared. This method is modeled after one used by Duncan (1972). He measured environmental complexity by taking the overall sum of the number of kinds of information each

decision maker had to consider and multiplied each by the squared measure of the degree of information dissimilarity. Equation 3.3 below was used in method two.

$$\text{Complex2} = T_1D_1^2 + T_2D_2^2 + T_3D_3^2 + T_4D_4^2 + T_5D_5^2 + T_6D_6^2 + T_7D_7^2 + T_8D_8^2$$

7. HYPOTHESES

The research hypotheses are as follows:

Hypothesis 1: The degree of outsourcing of technological information will be inversely associated with time to milestones.

Hypothesis 2: The degree of outsourcing of marketing information will be inversely associated with time to milestones.

Hypothesis 3: The degree of outsourcing of financial information will be inversely associated with time to milestones.

Hypothesis 4: The degree of outsourcing of general management information will be inversely associated with time to milestones.

Hypothesis 5: The degree of outsourcing of equipment will be inversely associated with time to milestones.

Hypothesis 6: Startup complexity will be directly associated with time to milestones.

8. STATISTICAL ANALYSIS

Hypotheses 1 through 5 were initially tested using simple regression. The regression equation (Equation 3.4) is stated below:

$$\text{Time to Milestones} = B_0 - B_1(\text{Degree of Outsourcing}) + E$$

The dependent variables were tested individually rather than jointly because each measures a very different kind of milestone achievement for the firm. Time to First Sale is an indication of initial market acceptance of the firm's products. Time to First Shipment is an indication of the firm's production efficiency. Using a multivariate dependent variable based on both variables would blur this distinction.

Hypothesis 6 was tested using stepwise regression for each category of resource and for two different measures of startup complexity as represented by Equations 3.2 and 3.3. To control for the effect of Startup Complexity on Time to First Sale and Time to First Shipment, Startup Complexity was entered into the regression model first and Degree of Outsourcing was entered next. The variance in the dependent variable explained by Startup Complexity is accounted for first. Any additional explained variance

can then be attributed to outsourcing. The regression equation is shown below as Equation 3.5:

$$\text{Time to Milestones} = B_0 + B_1(\text{Complexity}) - B_2(\text{Degree of Outsourcing}) + E$$

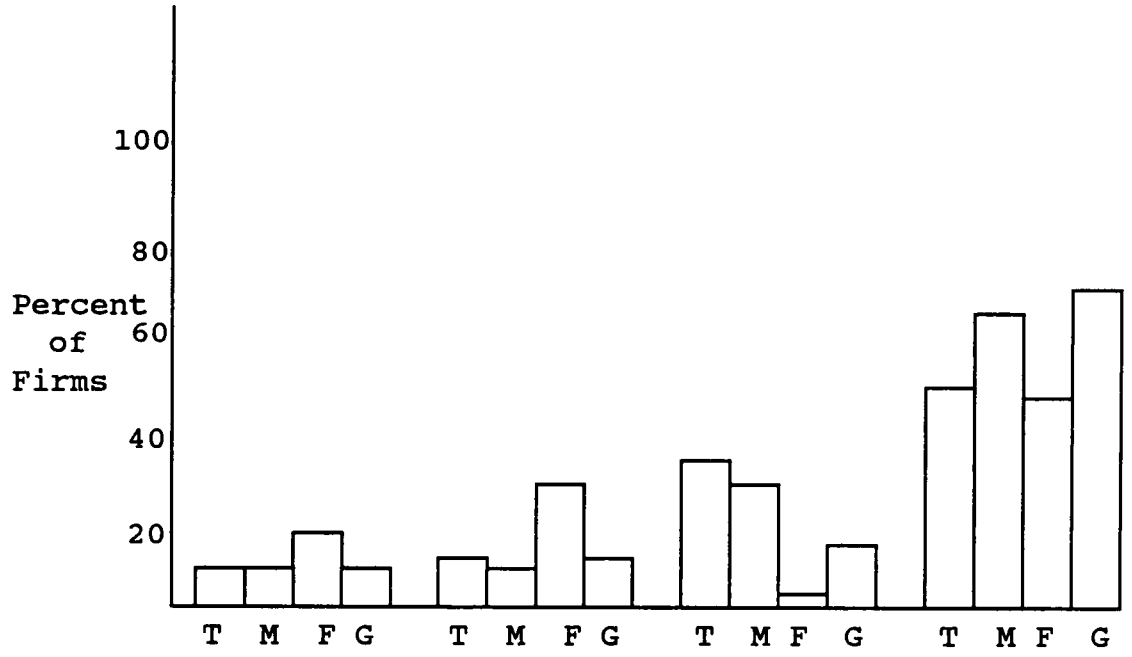
CHAPTER IV

RESULTS

1. DESCRIPTIVE STATISTICS: TRANSACTIONS USED TO OBTAIN INFORMATION

In the first year of operations, about one-half of the firms relied heavily on their own inhouse expertise for technical as well as business information. The majority of firms received 90 to 100% of technical, marketing, financial, and general management information from inside sources (Figure 5). Most firms got very little information from consultants but tended to get financial advice from consultants more often than any other kind of information (Figure 6). Teaming was rarely used. Only 3% of the sample used teaming and then to gain either technical or general management information (Figure 7). Only one firm licensed technology from another organization. Occasionally firms got information as free advice, generally more business than technical information (Figure 8). A number of firms were part of a small community-wide business network that freely exchanged business information.

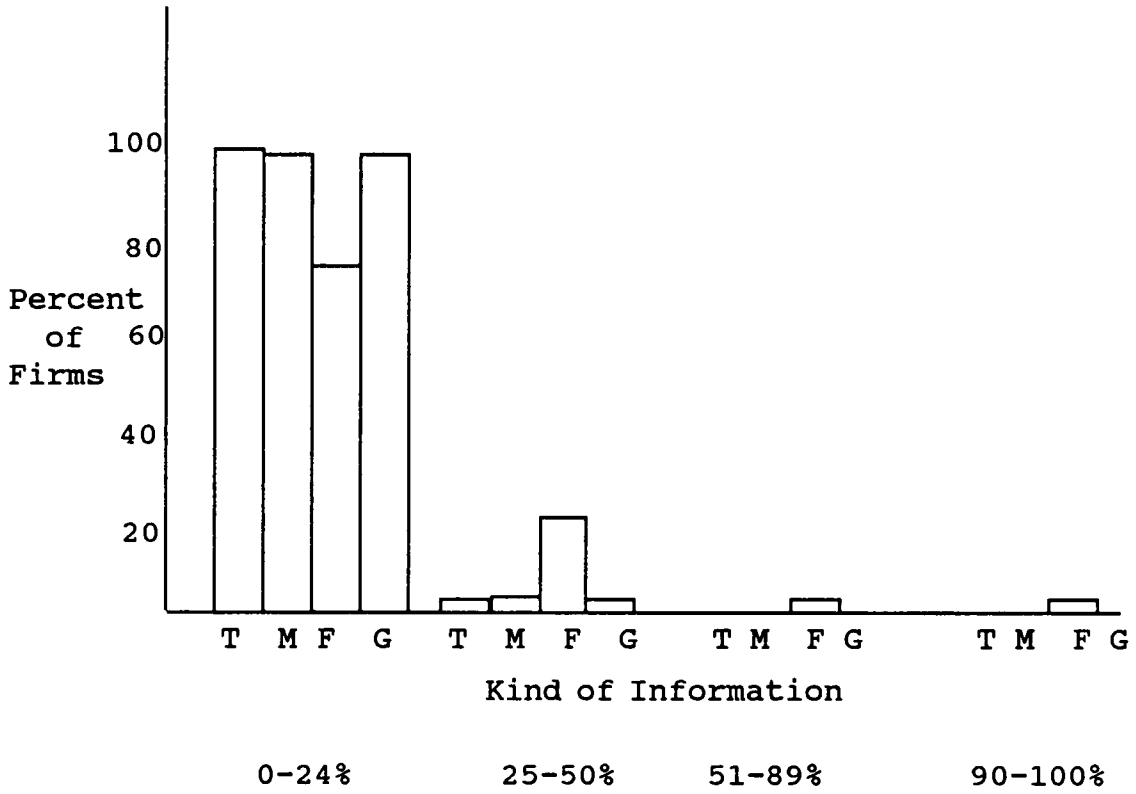
On average, firms obtained 75.4% of their technical



KEY: T = technical information
M = marketing information
F = financial information
G = general management information

Figure 5

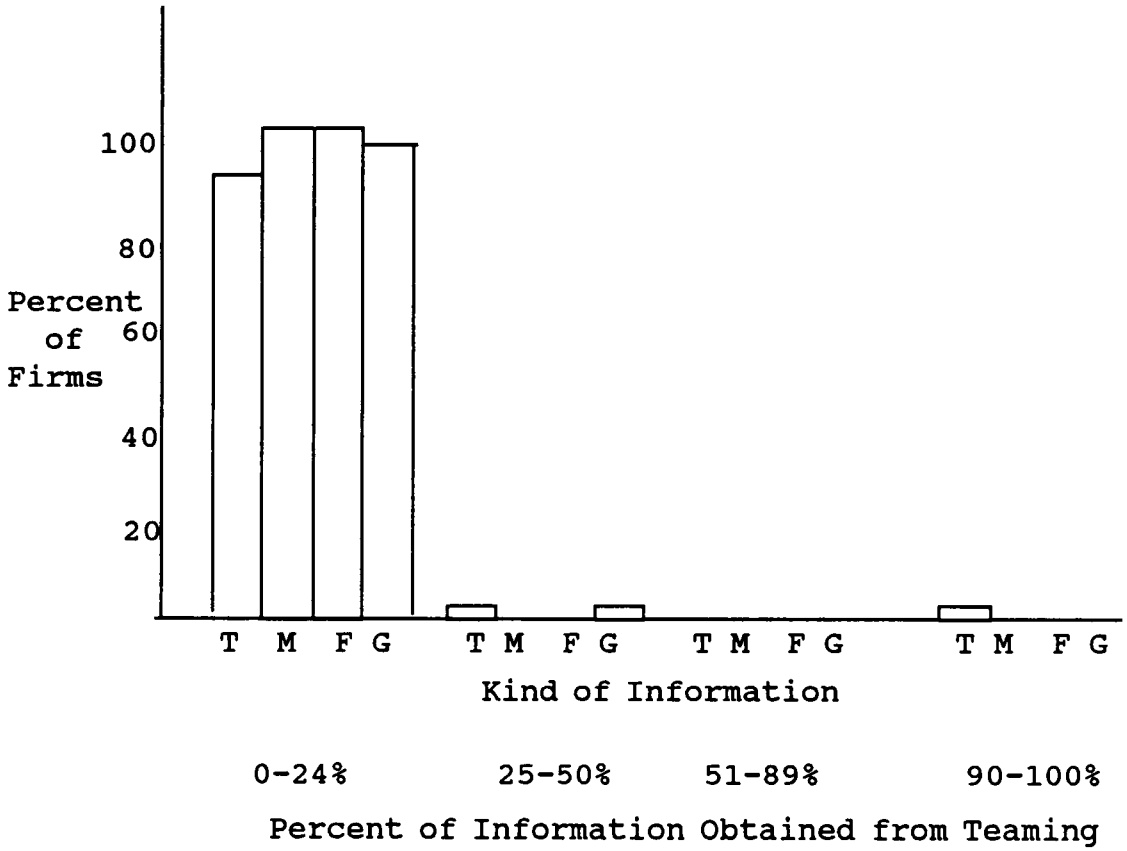
About One-half of Firms Relied Heavily on Inhouse Information



KEY: T = technical information
M = marketing information
F = financial information
G = general management information

Figure 6

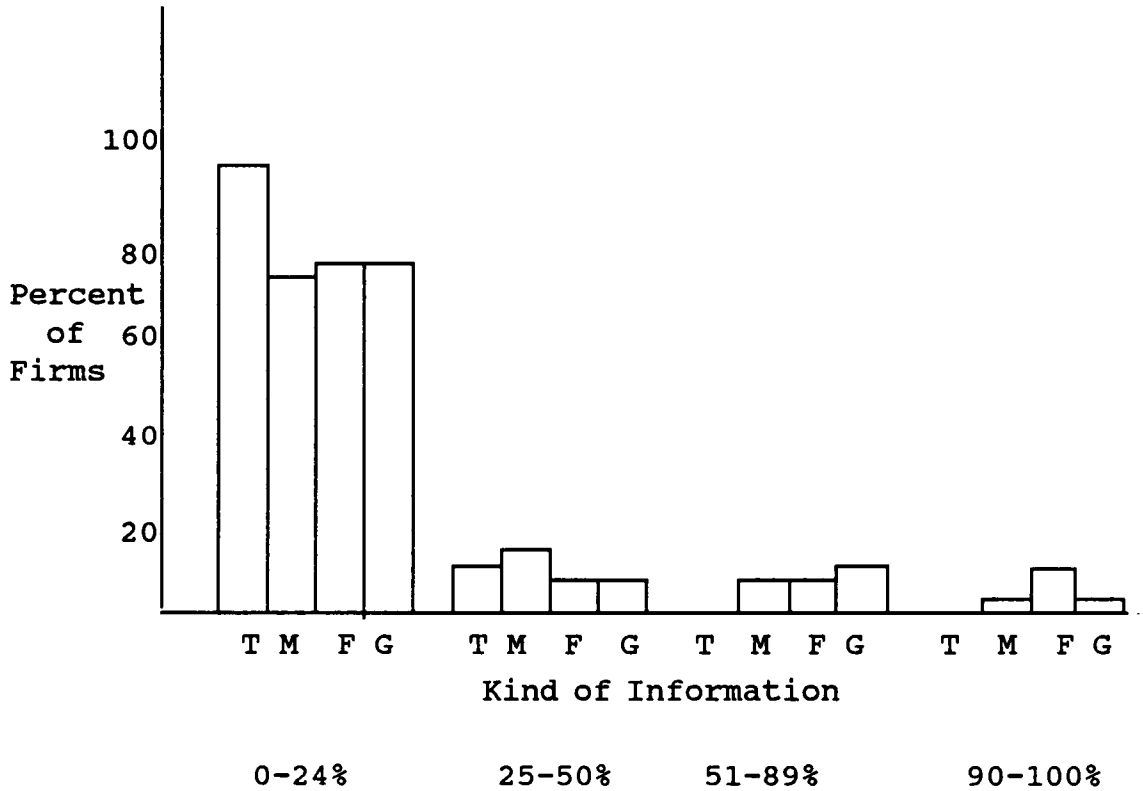
Firms Used Outside Paid Consultants Sparingly



KEY: T = technical information
M = marketing information
F = financial information
G = general management information

Figure 7

Teaming Was a Rare Event



KEY: T = technical information
M = marketing information
F = financial information
G = general management information

Figure 8

Firms Used Free Advice Occasionally

information inhouse, 3.9% from paid consultants, 6.6% from teaming, 8.0% from licensing activities, and 6.0% from free advice. Marketing advice was primarily obtained inhouse (81.4%); the remainder came from paid consultants (3.6%) and free advice (15%). For financial information, firms heavily depended on inhouse sources (66.8%) but they also depended on consultants (17.8%) and free advice (15.4%). Similarly, information on general management was largely from inhouse sources (84.3%), but consultants (0.4%), teaming (1.8%), and free advice (13.6%) also played a role.

Test statistics reveal that the differences between information developed inhouse and that obtained from all other transactions are significant for all categories of information. The amount of management information obtained as free advice is also significantly greater than that obtained from consultants and from teaming. Table 4 presents means and standard deviations for each transaction in each category of resource.

The data show that founders depended mainly on their own inhouse technical expertise. In-depth technical expertise was available in all firms; at least one member of each founding team had extensive experience with the firm's technology base.

Table 4

Means and Standard Deviations of Transactions for Information

Resource	Transaction	Mean	Standard Deviation
Technical information			
	Inhouse	75.4*	28.7
	Consultants	3.9	10.4
	Teaming	6.6	20.4
	Licensing	8.0	23.1
	Free advice	6.0	10.9
Marketing information			
	Inhouse	81.4*	28.8
	Consultants	3.6	12.2
	Free advice	15.0	25.7
Financial information			
	Inhouse	66.8*	33.7
	Consultants	17.8	25.7
	Free advice	15.4	29.3
Management information			
	Inhouse	84.3*	26.7
	Consultants	0.4	1.9
	Teaming	1.8	9.5
	Free advice	13.6**	26.0

*Technical, marketing, financial, and general management information developed inhouse are each significantly different from each of the other transactions within each category of resource at $p < 0.05$.

**Within the category, management information, free advice is statistically significantly different from consultants and from teaming at $p < 0.05$.

The founders mainly developed sources of marketing information inhouse. Those few entrepreneurs who tried marketing consultants generally found their services unsatisfactory.

About half of the firms had principles who had experience managing a small business, and about 28% had principles with experience in starting another business. Therefore, many firms had managers with some business and management experience. Some of this experience was concerned with financial matters. Given this, it is not surprising that many firms (66%) depended on experience within the firm for financial information. When firms did use consultants, they primarily used accountants.

About 84% of general management information was obtained inhouse. This can be explained to some degree by the fact that many firms had founders who had managerial experience. In addition, many of the firms were very small (five employees, on average) during the first year of operations, and informal management practices predominated.

2. DESCRIPTIVE STATISTICS: TRANSACTIONS USED TO OBTAIN EQUIPMENT

Only 22 firms made use of any R&D or production equipment during the first year of operation. As would be

expected, some service firms, like engineering consulting firms, needed neither R&D nor production equipment.

In the first year of business, the R&D and the production functions of the sample firms were often intermingled. For example, when a prototype developed in R&D is later sold, the R&D function also serves as the production function. Since it was difficult to distinguish between the the R&D function and the production function, it was difficult to distinguish between R&D equipment and production equipment. Consequently, the two categories of equipment, R&D and production, were combined into one category: equipment.

On an average, equipment was obtained from a variety of sources; 23.0% was developed inhouse, 43.3% was purchased, 11.0% was rented, 11.1% was obtained as loans and only 0.1 % was received as gifts. Subcontractors were used 11.5% of the time. The amount of equipment purchased is statistically significantly more than that obtained from renting, subcontracting, loans, or gifts. The amount of equipment obtained through gifts is significantly smaller than that obtained from all other sources. (See Table 5 for means and standard deviations.) Most firms seldom used renting, subcontracting, loans, or gifts as sources for equipment leaving inhouse development and purchases as major avenues for many firms (Figure 9).

Table 5

Means and Standard Deviations of Transactions for Equipment

Resource	Transaction	Mean	Standard Deviation
Equipment			
	Inhouse	23.0	29.9
	Purchase	43.3*	38.1
	Rent	11.0	23.7
	Subcontract	11.5	29.5
	Loan	11.1	19.2
	Gift	0.1**	0.5

*Purchase is statistically significantly different from rent, subcontract, loan, and gift at $p < 0.05$.

**Gift is statistically significantly different from inhouse, purchase, rent, and loan at $p < 0.05$.

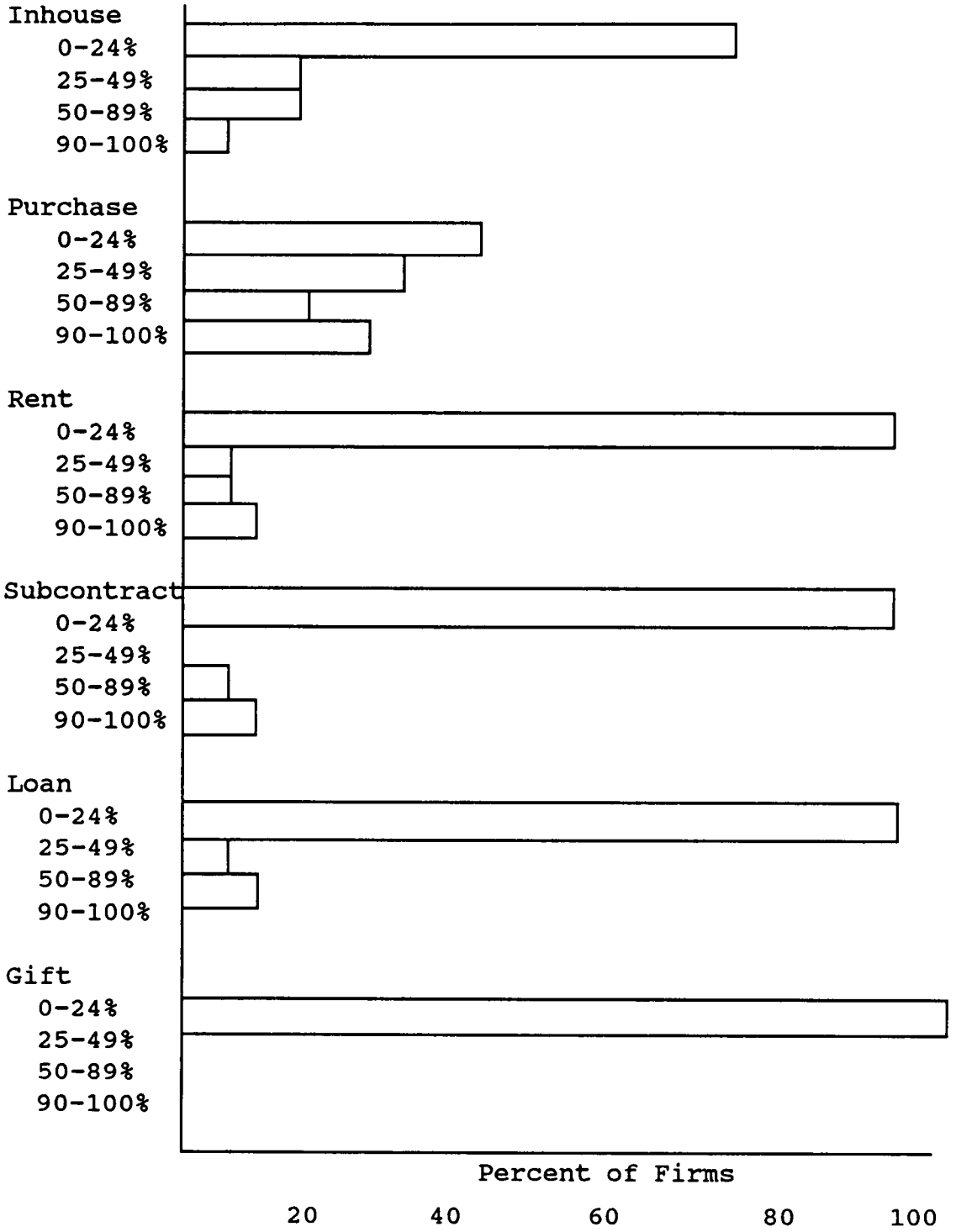


Figure 9

Production and R&D Equipment Came from Many Sources

Some firms bought used equipment and adapted it for their own purposes. For other firms, working on leading-edge technology, the necessary equipment was simply unavailable; these firms had no choice but to design and build their own equipment. Other firms were engaged in highly competitive arenas and built their own equipment as a means of maintaining secrecy and a competitive advantage. A few firms were able to rent or borrow equipment from other local technology-based companies and from the University of Tennessee.

3. DESCRIPTIVE STATISTICS ON THE INDEPENDENT AND DEPENDENT VARIABLES

Figures 10, 11, 12, and 13 are histograms showing the distributions of the Degree of Outsourcing for technical, marketing, financial, and general management information, respectively. Degree of Outsourcing scores were obtained using Equation 3.1. These aggregate scores reflect, as do the histograms for individual transactions, that many firms did little outsourcing. The average scores for all types of outsourcing are presented in Table 6. T-tests reveal that the scores for the different types of information are not statistically different from each other.

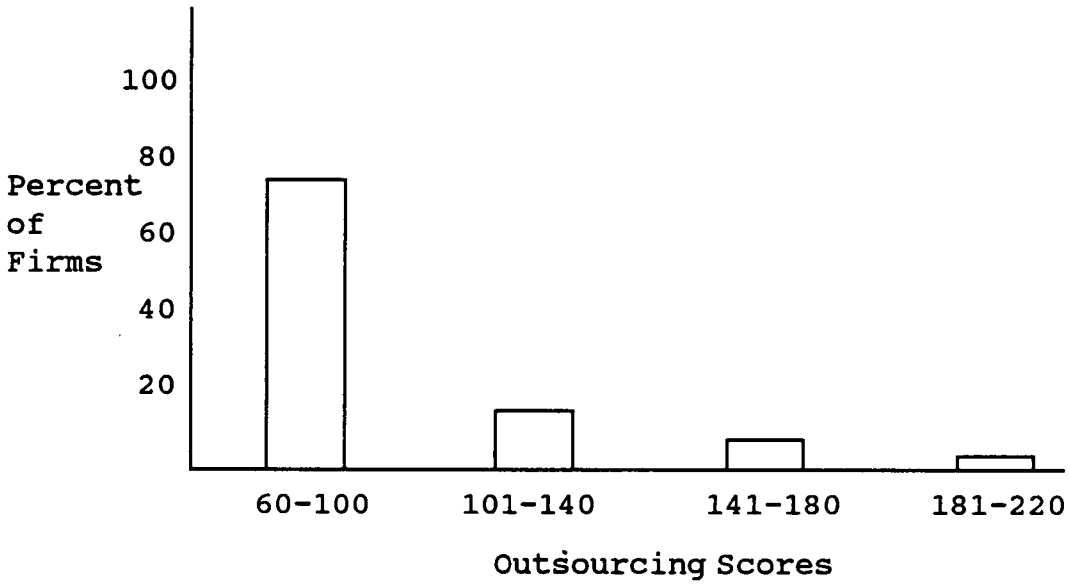


Figure 10

Degree of Outsourcing for Technical Information

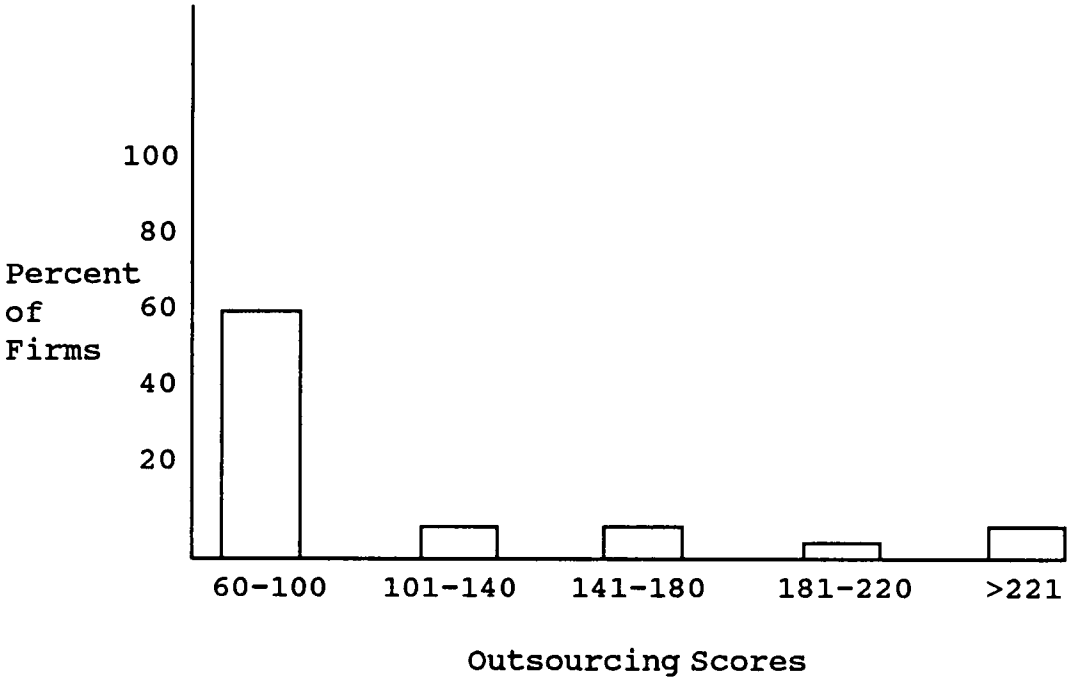


Figure 11

Degree of Outsourcing for Marketing Information

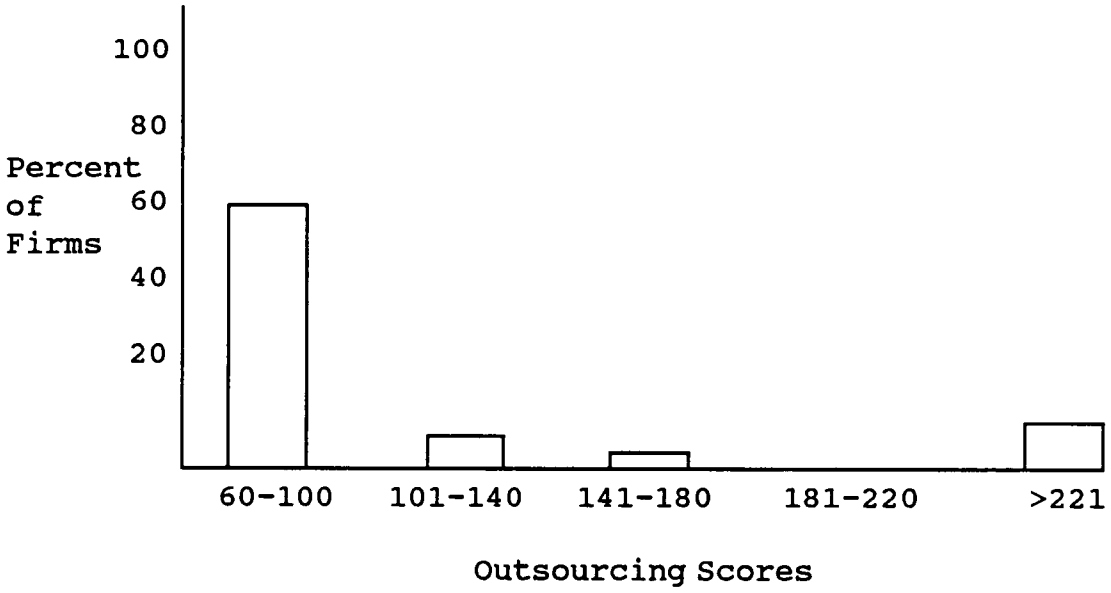


Figure 12

Degree of Outsourcing for Financial Information

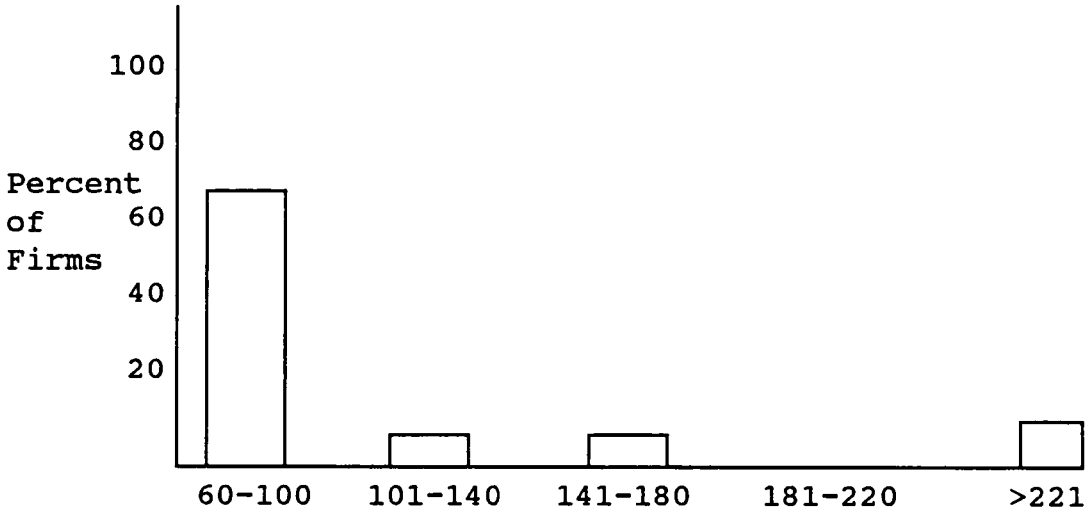


Figure 13

Degree of Outsourcing for General Management Information

Table 6

Means and Standard Deviations for Degree of Outsourcing

Variable	Mean	Standard Deviation
Degree of Outsourcing for		
Technical Information	88.367	39.466
Marketing Information	119.942	94.217
Financial Information	120.825	107.542
Management Information	115.100	95.380
Equipment	73.411	41.324

Since Degree of Outsourcing for equipment was measured on a different scale, it was not compared to the others. Figure 14 presents the histogram for Degree of Outsourcing for equipment. The histogram shows that these scores are more evenly distributed that the scores for the various kinds of information.

Average scores for Time to First Sale and Time to First Shipment are given in Table 7. On average, firms reached first sales in 3.518 months and made their first shipments after 5.357 months. These values are statistically significantly different from each other. Histograms for the distributions of Time to First Sale and Time to First Shipment are presented in Figures 15 and 16, respectively. About 75% of all the firms made their first sale with the first three months of operations, and almost 40% of firms made their first shipment within the same time frame.

Table 8 presents the correlation matrix for all the dependent and independent variables tested. Time to First Sales is significantly correlated to Degree of Outsourcing for Technical Information ($r = 0.429$; $p < 0.05$), Degree of Outsourcing for Marketing Information ($r = -0.314$; $p < 0.10$), and Degree of Outsourcing for Financial Information ($r = -0.273$; $p < 0.10$). Given the small sample size, a p level of 0.10 was also used to qualify the last two variables for hypothesis testing.

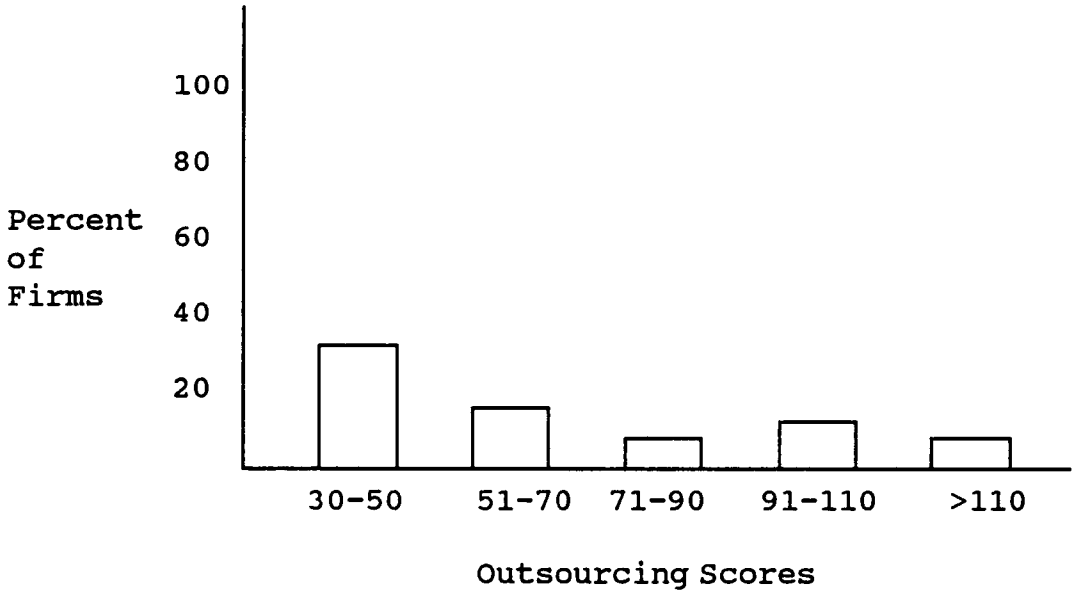


Figure 14

Degree of Outsourcing for Equipment

Table 7

Means and Standard Deviations for Milestones

Variable	Mean	Standard Deviation
Time to First Sale	3.518*	3.990
Time to First Shipment	5.357	4.474

*Time to First Sale is statistically significantly different from Time to First Shipment at p = 0.001.

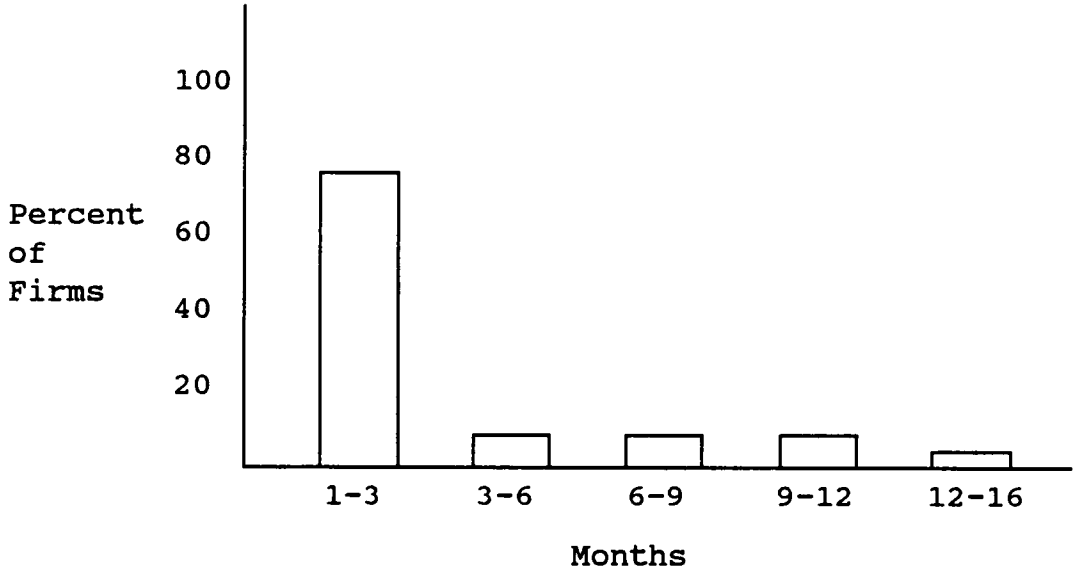


Figure 15

Months Until First Sale

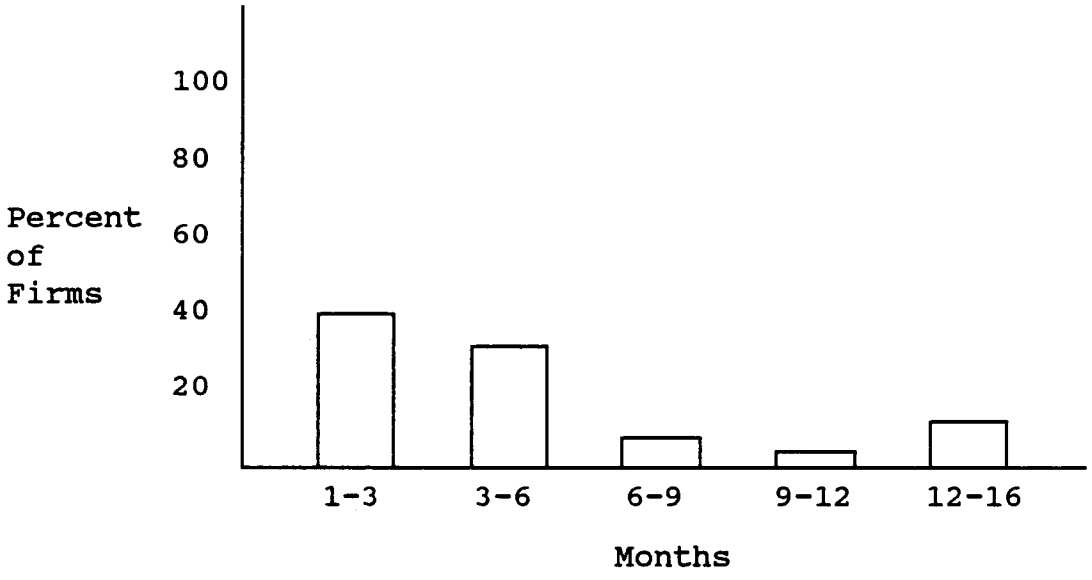


Figure 16

Months Until First Shipment

Table 8

Intercorrelations Among Variables

Variables	1	2	3	4	5	6	7
1 Time to First Sale							
2. Time to First Shipment	.822*						
Degree of Outsourcing for							
3. Technical Information	.429*	.291					
4. Marketing Information	.314**	.149	.280				
5. Financial Information	-.273**	-.243	.099	-.100			
6. Management Information	-.141	-.211	-.030	.055	-.274		
7. Equipment***	-.128	.015	.040	.239	-.192	.022	

* significant at the 0.05 level

** significant at the 0.10 level

*** n=22 for equipment, for all others n=31

4. HYPOTHESIS TESTING

Hypothesis 1

Hypothesis 1 predicted that firms which used a high degree of outsourcing would reach first sales in less time than firms which used little outsourcing. In contrast, the analysis shows that firms which used little outsourcing for technical information took less time to achieve a first sale than firms that used a high degree of outsourcing ($R^2 = 0.110$) (Table 9, Model 1). Hypothesis 1 is not supported when Time to First Shipment is used as the dependent variable (Table 10, Model 6).

Hypothesis 2

The relationship between Time to First Sale and Degree of Outsourcing for Marketing Information is weakly supported by the analysis ($R^2 = 0.048$); but, as with technical information, the direction of the relationship is not as predicted (Table 9, Model 2). Firms that used little outsourcing for marketing information took less time to achieve a first sale than firms that outsourced heavily. Hypothesis 2 is not supported for Time to First Shipment (Table 10, Model 7).

Table 9

Simple Regression Results for Time to First Sale

Variable	Standard Coefficient	T	P level	Adjusted R^2
MODEL 1				
Constant	0.000	2.568	0.016	
Degree of Outsourcing for Technical Information	0.378	2.083	0.023	0.110
MODEL 2				
Constant	0.000	2.632	0.014	
Degree of Outsourcing for Marketing Information	0.289	1.536	0.068	0.048
MODEL 3				
Constant	0.000	-0.077	0.939	
Degree of Outsourcing for Financial Information	-0.267	-1.415	0.084	0.036
MODEL 4				
Constant	0.000	0.495	0.625	
Degree of Outsourcing for Management Information	-0.122	-0.625	0.268	0.000
MODEL 5				
Constant	0.000	0.318	0.754	
Degree of Outsourcing for Equipment	-0.155	-0.702	0.245	0.000

Table 10

Simple Regression Results for Time to First Shipment

Variable	Standard Coefficient	T	P level	Adjusted R^2
MODEL 6				
Constant	0.000	1.915	0.067	
Degree of Outsourcing for Technical Information	0.243	1.279	0.106	0.023
MODEL 7				
Constant	0.000	2.092	0.046	
Degree of Outsourcing for Marketing Information	0.120	0.616	0.271	0.000
MODEL 8				
Constant	0.000	0.548	0.588	
Degree of Outsourcing for Financial Information	-0.234	-1.227	0.231	0.115
MODEL 9				
Constant	0.000	0.511	0.614	
Degree of Outsourcing for Management Information	-0.199	-1.034	0.155	0.003
MODEL 10				
Constant	0.000	1.362	0.188	
Degree of Outsourcing for Equipment	0.005	0.021	0.491	0.000

Hypothesis 3

Hypothesis 3 is weakly supported by the data for Time to First Sale (Table 9, Model 3) but not for Time to First Shipment (Table 10, Model 8). Firms that used more outsourcing for financial information reached first sales more rapidly than firms that outsourced less ($R^2 = 0.036$).

Hypotheses 4 Through 5

Hypotheses 4 and 5 are not supported. No statistically significant relationship exists between Time to First Sale and Degree of Outsourcing for General Management Information (Table 9, Model 4) or Equipment (Table 9, Model 5). The predicted relationship is also not supported for Time to First Shipment with Degree of Outsourcing for General Management Information (Table 10, Model 9) or Equipment (Table 10, Model 10).

Multiple Regression Models

The relationships expressed in Hypotheses 1 through 3 were tested using multiple regression models with combinations of Degree of Outsourcing for Technical, Marketing, and Financial Information (Table 11, Models 11, 12, and 13). Model 13 which contains all three variables explains about 16% of the variance in Time to First Sale.

Table 11

Multiple Regression Results for Time to First Sale

Variable	Standard Coefficient	T	P level	Adjusted R^2
MODEL 11				
Constant	0.000	2.715	0.012	
Degree of Outsourcing for Technical Information	0.325	1.737	0.047	
Degree of Outsourcing for Marketing Information	0.204	1.091	0.143	0.017 ($p = 0.040$)
MODEL 12				
Constant	0.000	1.846	0.077	
Degree of Outsourcing for Technical Information	0.358	1.992	0.028	
Degree of Outsourcing for Financial Information	-0.204	-1.317	0.100	0.135
MODEL 13				
Constant	0.000	1.981	0.059	
Degree of Outsourcing for Technical Information	0.292	1.589	0.062	
Degree of Outsourcing for Marketing Information	0.242	1.314	0.100	
Degree of Outsourcing for Financial Information	-0.269	-1.504	0.074	0.159 ($p = 0.034$)

Hypothesis 6

Stepwise regression results for Time to First Sale and Time to First Shipment can be found in Tables 12 and 13 respectively. The data fails to support the hypothesis that a direct relationship exists between Startup Complexity and either of the firm milestones. The moderating effect of Startup Complexity on time to milestones is not supported.

5. QUALITATIVE FINDINGS

The open-ended interview questions help explain why so little variance existed in the measures of Degree of Outsourcing and why the relationships between Degree of Outsourcing for Technical and Marketing Information and Time to First Sales is positive and not negative as predicted. The interviews revealed, for example, that many firms had their technology in place before they opened their doors. Very few firms obtained technology from any category other than "Developed Inhouse." Much of the technology characterized as developed inhouse was not developed after the firm began, but it was developed prior to startup and transferred as the founder's expertise or intellectual capital. This intellectual capital was very often acquired within the organization where the founder was employed prior to startup.

Table 12

Stepwise Regression Results for Time to First Sale

Variable	R Squared	Adjusted R Squared	P Level
Complex	0.007		
Degree of Outsourcing for Technical Information	0.137		
Full Model	0.144	0.076	0.143
Degree of Outsourcing for Marketing Information	0.078		
Full Model	0.085	0.012	0.328
Degree of Outsourcing for Financial Information	0.065		
Full Model	0.072	0.000	0.394
Degree of Outsourcing for Management Information	0.009		
Full Model	0.016	0.000	0.814
Complex	0.019		
Degree of Outsourcing for Equipment	0.033		
Full Model	0.052	0.000	0.601

Table 12 (continued)

Variable	R Squared	Adjusted R Squared	P Level
Complex2	0.013		
Degree of Outsourcing for Technical Information	0.147		
Full Model	0.160	0.090	0.123
Degree of Outsourcing for Marketing Information	0.131		
Full Model	0.144	0.073	0.154
Degree of Outsourcing for Financial Information	0.067		
Full Model	0.080	0.003	0.368
Degree of Outsourcing for Management Information	0.005		
Full Model	0.018	0.000	0.802
Complex2	0.023		
Degree of Outsourcing for Equipment	0.038		
Full Model	0.061	0.000	0.569

Table 13

Stepwise Regression Results for Time to First Shipment

Variable	R Squared	Adjusted R Squared	P Level
Complex	0.000		
Degree of Outsourcing for Technical Information	0.061		
Full Model	0.061	0.000	0.454
Degree of Outsourcing for Marketing Information	0.015		
Model	0.015	0.000	0.826
Degree of Outsourcing for Financial Information	0.060		
Model	0.060	0.000	0.463
Degree of Outsourcing for Management Information	0.050		
Model	0.050	0.000	0.814
Complex	0.001		
Degree of Outsourcing for Equipment	0.000		
Model	0.001	0.000	0.992

Table 13 (continued)

Variable	R Squared	Adjusted R Squared	P Level
Complex2	0.000		
Degree of Outsourcing for Technical Information	0.080		
Full Model	0.080	0.004	0.366
Degree of Outsourcing for Marketing Information	0.054		
Full Model	0.054	0.000	0.512
Degree of Outsourcing for Financial Information	0.082		
Full Model	0.082	0.005	0.528
Degree of Outsourcing for Management Information	0.039		
Full Model	0.039	0.000	0.622
Complex2	0.001		
Degree of Outsourcing for Equipment	0.000		
Model	0.001	0.000	0.992

Extensive marketing information was also often obtained prior to startup. Founders learned about their markets before the firm began operations, and much marketing information was categorized "Developed Inhouse."

In addition to the transactions used to acquire resources after the firm began, qualitative data revealed that several other strategies were used to acquire resources both prior to startup and in the first year of operation, including (1) pre-venture searches, (2) formal and informal transfers from existing organizations, (3) bridge businesses, and (4) the use of personal resources for business purposes. A mixture of these strategies were often used by entrepreneurs.

Pre-Venture Searches

This strategy generally involved acquiring resources prior to startup and was often used for obtaining both technical and business information. It took basically two forms: (1) extensive pre-startup information searches and (2) finding partners with resources.

Pre-startup information searches. Using this strategy, the entrepreneur was able to put together much of the resource package for the intended business while still employed by someone else. In these instances, the

entrepreneurs spent their own money and used their own time to gather information for their intended startups.

Some entrepreneurs spent several years in the pre-venture stage gathering information before actually starting their firms. One founder accumulated over one thousand articles, documents, and policy manuals of former employers prior to opening his firm. To paraphrase[1] this government subcontractor:

> I had an organization chart for one government agency that I had targeted as a potential customer, and I knew who all the buyers were. I learned the procurement procedures in various agencies from my document collection. I also subscribed to the Commerce Business Daily which describes government contracts available. (Firm 29)

Another founder commented on his pre-venture search for information. He and his partner spent their spare time for almost four years travelling extensively, using their own money, to search for information relevant to the startup of their business. All of this activity took

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[1] All excerpts from respondents have been paraphrased to protect the anonymity of the respondent's company and to facilitate the transition from the spoken to the written word. As much of the respondent's original wording and phrasing was used as possible.

place while the founders were on the faculty of a major university. This entrepreneur's comments reveal how extensive the pre-venture search for information can be.

> My partner and I realized that a technology we were familiar with was very close to being applied commercially. So we began fantasizing about the possibility of starting a company based on this technology. Since we were academics who knew nothing about how to start a business, we took the academic approach and decided that we needed to study the process. We quickly understood that you need to study markets, distribution, finance, etc. We travelled all over the United States, looking at how to start a company, at our markets, where customers would be, who our competition was. We spent a great deal of time while still academics studying this process in our spare time. Finally, several business advisors including a local economic developer, the head of a local Chamber of Commerce, and our attorney were saying, "You don't need to study how to start a business that extensively--you've already got more information than you need--just start the darn thing!" Our lawyer actually went to Nashville to charter our corporation, handed us the charter, and said, "You've got a company." We were very cautious about how we got started and took almost four years. (Firm 45)

Another entrepreneur discussed arrangements with his former employer which facilitated his pre-venture activities. The entrepreneur was able to spend considerable time and effort in pre-venture activities because he was able to negotiate with his employer for

reduced pay in exchange for a part-time leave of absence. The cooperative attitude of the respondent's former employer was an asset to his entrepreneurial aspiration. The respondent also discussed how he used some of his spare time for a number of years to collect information about starting a business.

> I took a 20% unpaid leave of absence from my job for the whole calendar year prior to my startup, so I could publicly be involved in startup activities. I spent much of this time in marketing activities. We signed a contract with our first client late that year, but we didn't start revenue generating activities until the next year. About four years earlier, I began meeting with any experienced entrepreneur I could get an audience with. I spent my time learning from them: how they did it, what they did, and what they would do differently. (Firm 26)

Partners with resources. In this strategy, prior to the start of the business, entrepreneurs acquired partners who possessed resources that were needed for the venture. These resources could, of course, be monetary, but also included experience, space, and equipment. For example, an aspiring entrepreneur with technical expertise would secure a partner with business know-how. The partners were chosen to complement the entrepreneur's skills and knowledge or to provide some physical resources that the lead entrepreneur did not possess. Some examples follow:

> I started my business with three partners, partner one had office space and equipment and partner two owned a machine shop. I had experience in flexible manufacturing. What we do here could be considered flexible manufacturing. Within five months, I bought out the first partner; and within another four months, I bought out my last partner. (Firm 35)

> On a part-time, personal time basis, I was able to develop a process for making a classified product. I successfully bid on a government contract to make this product and started my firm as a joint venture with the owner of a tool and engineering shop. I later bought out this partner. (Firm 41)

> Four guys founded this firm. Partner one was our business advisor. He had worked at one local small business and had been involved in the startup of another. Two other partners were experienced engineering technicians and excellent fabricators. I had been part of the team that had spent six years developing the technology that formed the base of our firm. (Firm 34)

Transfers from Existing Organizations

Another set of companies was started when a department, unit, or group of employees were spun-off from an existing company. In these cases, the resources were essentially in place when the new firm opened its doors. In some cases, the unit or department was purchased from the parent. In other cases, the transfers took place in less formal ways. Comments on some formal transfers follow:

> The company started when a group of people left the parent company. The group was essentially the manufacturing portion of that company. We left because the parent company decided it wanted to pursue a more systems kind of business and did not want to be involved in our business any longer. The company president wanted to sell the division. I was a general manager at the time, and I tried to persuade him not to. He was unable to sell the division; and since I had tried to convince him not to sell, the least I could do was to put my money where my mouth was. (Firm 2)

> The four principles of this firm acquired a business unit of a local firm. We acquired technology, equipment, personnel, back orders, and customers. Later we acquired another technology company and merged the two technologies to manufacture our product. (Firm 9)

Bridge Businesses

Some entrepreneurs were able to negotiate with their pre-venture employers to work part time or to use personal time during pre-venture planning or prototype development. Others did not have such favorable transition arrangements. For these, the road to the business of their choice included a detour via a bridge business. In these cases, the entrepreneur started a business which required few resources and which was different from the business he really wanted to start. The bridge business served as a temporary "cash cow" generating funds for the development of the "star" business (Henderson, 1973). The bridge business is likened to the BCG "cash cow" because

it yields cash in excess of what is needed to sustain operations. The business that the entrepreneur really wants to be in is described as a "star" because this business is thought to have growth and profit opportunities.

Six of the firms in the sample operated bridge businesses prior to and during the startup of the business of interest. Once the "star" business was up and running, the bridge business ceased operating, but the firm continued in a new line of business. Some excerpts from founders of bridge businesses follow:

> My partner and I were working for a government subcontractor when we recognized that there was a need for a certain product. We didn't think it would be honorable to do market analysis while working for our former employer, so we quit to do a market analysis. We spent two years travelling and gathering market information. At first we lived on our savings but then started consulting unrelated to our present business, but 90% of our energies were devoted to the real business of interest. We got a few contracts--bridge contracts--but you can't discount them as they demonstrate to investors that you can get awarded contracts. One of these contracts was very important to help us sustain the business. We opened house in 19xx, and we shipped our first product in just under a year. We couldn't have done that if we hadn't spent the previous two years getting ready--not just planning, marketing, and seeking financing, but we purchased a major piece of equipment during that time also. (Firm 10)

> In the first year of business, I sold consulting services while working on product development. (Firm 11)

> Our primary product takes years and a lot of capital to put on the market. We are experts in this field, but the only way we can get a product to market is through grants. We also consult and produce some computer software. The consulting is just to fill in the gaps, but we had much rather be doing research and making products. You do what you've got to do. (Firm 14)

Most of the bridge businesses were in existence for a very few years. Some bridge businesses, like the one below, have extended lives.

> The company grew out of a desire to manufacturer a product my partner and I had patented and purchased exclusive rights to. This is a turnkey type of instrument, and its manufacture required more resources than either of us had. So our firm started manufacturing another product, easier to make and requiring less resources, so we could accumulate the resources needed to develop the turnkey instrument. We started this business nine years ago and have yet to manufacture the turnkey instrument. We underestimated what resources it would take to build a major turnkey instrument. (Firm 5)

Use of Personal Resources for Business Purposes

The interviews disclosed that entrepreneurs used personal resources for business purposes during the early years. These included using space at home and borrowing space from others, sacrificing leisure hours, working without pay, and depending on a spouse for support.

Many firms were started in garages, basements, and spare rooms. Firms were also started on a part-time basis while the entrepreneur continued working for his employer. Other entrepreneurs were able to work full-time on the business while a spouse supported the family. In 13 of the 32 firms, the principles took no salary until after the first year of operations. Of those taking no salary initially, some waited as long as four to five years, with an average of two and one-half years, to pay themselves.

> Our business started in the basement of our home and later moved to our present location. (Firm 7)

> We operated without an office for a couple of years. We worked out of the office of our former employer. We didn't take much advantage, but we did work there for about two years. Later we went in with another company -- we couldn't afford an office of our own because we couldn't find a space small enough. (Firm 20)

> After two years our business went from a part time, after hours business working out of the garage at home to a full-time operation. (Firm 34)

> I quit my job to get the business started; my partner joined me full-time three months later. I had a spouse to support me, he didn't. (Firm 31)

I took a salary out of the business for the first few months but none since then. The company owes me a lot of money. (Firm 44)

6. ADDITIONAL STRATEGIES AND OUTSOURCING

The additional resource acquisition strategies elicited from the field interviews provide a richer view of how entrepreneurs actually assemble the resources needed for startup. Yet all exhibit at least some of the dimensions of outsourcing. In pre-venture search activities, entrepreneurs outsourced to a large degree. They gathered free information, using as few of their own assets as possible, making small incremental investments of their time and money, and mainly entering into no contractual arrangements. In cases where entrepreneurs did acquire resources through contractual arrangements with partners, those contracts were often shortened when the entrepreneurs bought out their partners' interests.

Bridge businesses also demonstrate some of the dimensions characteristic of outsourcing. The bridge business is one that requires little or no investment of funds, no long term contractual agreements, and almost no drain on company assets.

The use of the entrepreneur's personal resources for business purposes also demonstrates some of the dimensions of outsourcing. Here, the entrepreneur has some excess

capacity of a personal resource that can be utilized efficiently by the business. This requires no contracts, no major investments, and little if any drain on business assets.

Only formal transfers of resources from existing organizations downplay outsourcing. These acquisitions of operating business units involve major investments of capital. The interest payments on long term contracts with lenders cause a steady drain on the firm's assets. To the extent that unused capacity existed in the acquired business unit, under-utilized capacity could continue to exist in the new business.

The effects of these resource acquisition strategies on business performance is less clear. The measurement of time to milestones was obscured by the extended pre-venture period and by the nebulous starting point of pre-venture activities. Certainly, these strategies led to business formation and, in many cases, initial survival. These strategies also facilitated the startup of businesses by inexperienced and resource-constrained entrepreneurs.

CHAPTER V

DISCUSSION OF RESULTS

1. QUANTITATIVE RESULTS

One purpose of this study was to test the hypothesis that the use of outside resources by new business startups would shorten the time to reach certain performance milestones. Furthermore, the research hypothesis, modeled in Figure 1, predicted that this effect would be moderated by the complexity of the startup. Firms facing more complex startups were predicted to take longer to reach milestones than firms facing less complex startups.

The research hypothesis was tested for several kinds of resources including technical, marketing, financial, and general management information as well as R&D and production equipment. Using the extant literature, primarily the work of Stevenson, Timmons, and their co-authors (Stevenson, et al., 1985; Timmons, et al., 1985), a construct, Degree of Outsourcing, was defined and operationalized to represent the varying degrees to which a firm can use outside resources. Two milestones, Time to First Sale and Time to First Shipment, served as dependent variables. Complexity was measured in two different ways,

both based on the number of tasks required to start the business and the difficulty of each of those tasks.

The regression results indicate that Startup Complexity does not influence Time to First Sale or Time to First Shipment. Complexity explained essentially none of the variance in either milestone, and no statistically significant relationship existed between complexity and the milestones tested. This variable is new, and it is possible that it was operationalized incorrectly.

None of the variance in Time to First Shipment was explained by any kind of outsourcing. Other factors must account for this variance, perhaps differences in efficiency and the stage of development of the process technology.

Several kinds of outsourcing explained some of the variance in Time to First Sale. However, in contrast to the direction predicted, firms that used less outsourcing for technical information ($R^2 = 0.110$) and marketing information ($R^2 = 0.048$) achieved a first sale faster than firms that used more outsourcing. For financial information, firm that outsourced more did reach milestones faster that firms that outsourced less ($R^2 = 0.036$). A multiple regression model (Table 11, Model 13, page 111) incorporating three kinds of outsourcing, technical, marketing and financial information, explained about 16% of the variance in time to first sales.

The results for technical and marketing information are opposite to that suggested by the literature and predicted by the research hypotheses. The results suggest that technology-based firms are better off if they have technical and marketing information inhouse. Having the necessary technical and marketing information inhouse helps these firms achieve first sales faster than firms which have to outsource for this information. A technology-based firm that has insufficient inhouse understanding of its technology and markets appears to be at a disadvantage.

2. QUALITATIVE FINDINGS

This work had a qualitative component as well. The purpose of the qualitative research was to add breadth and depth to our understanding of the resource acquisition strategies of entrepreneurs, especially those strategies which encompassed or were related to the use of outside resources. The qualitative findings are valuable in two respects. First they help explain the quantitative findings, and second, they add to our understanding of how entrepreneurs acquire resources in starting their firms.

The qualitative findings emphasize that many resources were acquired prior to the startup of the firm. Entrepreneurs used numerous pre-venture resource

acquisition strategies to assure that the resources needed in the first year of operations were in place before the firm began. Some of these pre-venture strategies included acquiring partners who had needed resources and extensive pre-ventures searches for resources, especially business information.

In addition, the technology-based firms were founded by scientists and engineers who were experts in their firms' technologies. Every founder, or at least one member of the founding team, had extensive experience with the firm's technology base. In such cases, there was little need to outsource for technical information.

Since many resources were obtained prior to startup or were part of the experience and expertise that founders brought to the firm, many firms had little need to acquire resources at all during the first year of operations. It is very possible that entrepreneurs did not outsource during the first year of operations because they had no need to acquire additional resources.

3. FAVORABLE AND UNFAVORABLE TRANSITION SITUATIONS

Figure 17 expands the model presented in Figure 1 (page 4) by including the resource acquisition strategies which were discovered in interviews with entrepreneurs. The new model indicates that entrepreneurs employ numerous

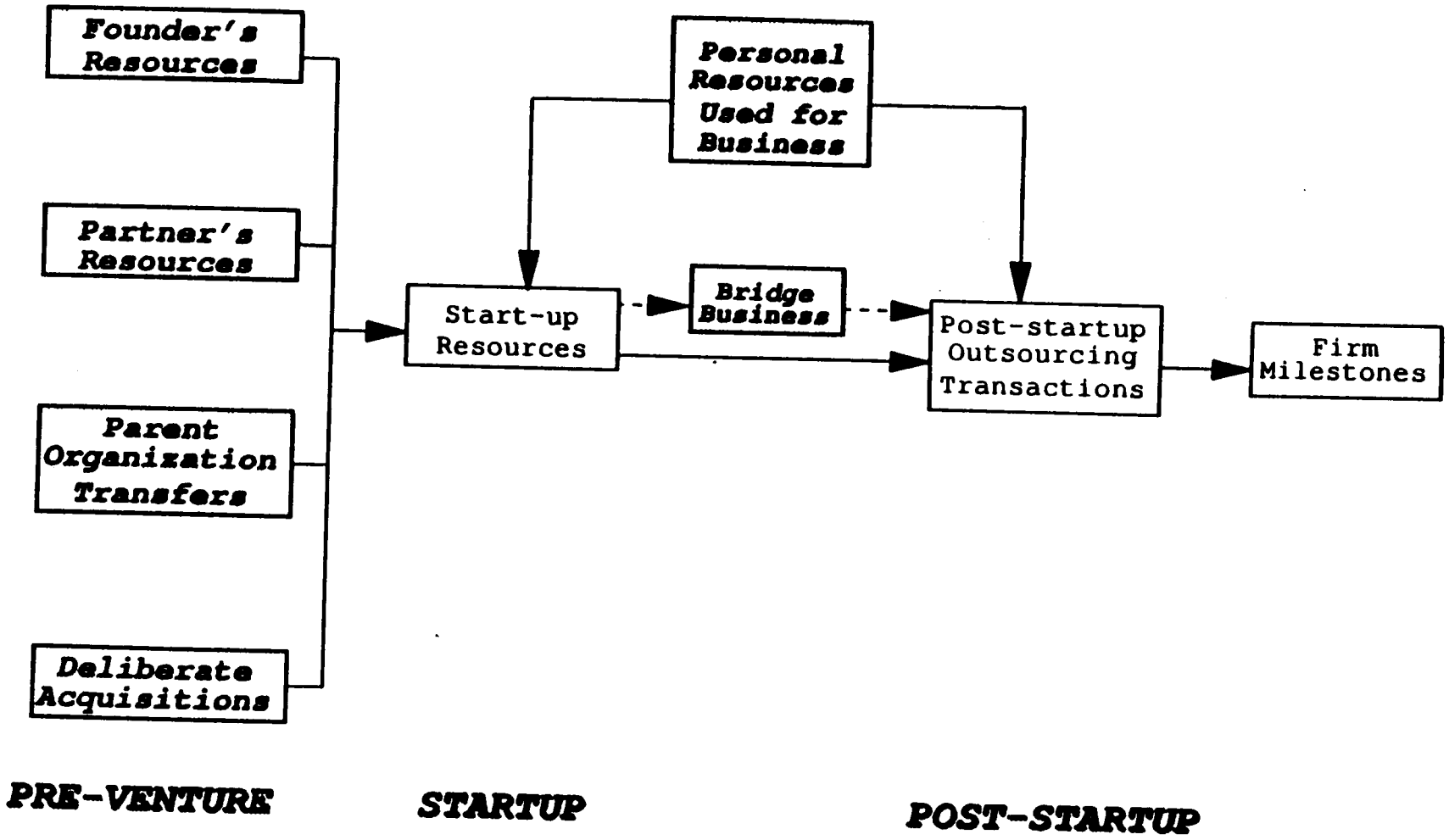

Figure 17
A Model of the Resource Acquisition Strategies of Entrepreneurs

strategies to acquire resources in starting new businesses and show several strategies which occur before the business begins. The degree of outsourcing in the first year is dependent on the resources in place at startup, the kinds of transactions used to acquire resources during the first year, and two additional strategies: the use of personal resources and the bridge business. The model still predicts that the degree of outsourcing after startup will influence time to firm milestones.

Strategies which determine the resources at startup are, to some degree, a function of how favorable the transition is from the entrepreneur's previous job to the new venture. Some entrepreneurs were loosely-supervised professionals who were able to acquire resources deliberately, especially business and technical information, while still working for other organizations. Others were able to negotiate time off from their jobs to engage in pre-venture activities.

Other favorable transition situations occurred when entrepreneurs were able to transfer to their new firms considerable personal know-how and skill, both technical and managerial, gained over the years working for others. Still other founders were able to buy existing businesses from former employers.

In addition to personal expertise transferred from previous jobs, some entrepreneurs had other assets needed

by their new businesses like capital, equipment, and business connections. In favorable transition situations, founders who lacked needed resources were able to take on partners who did possess them.

Entrepreneurs in less favorable transition situations were unable to acquire the resources needed for the business prior to startup. Some of these people started bridge businesses which had low startup costs and often relied heavily on the personal expertise of the founders. Bridge businesses generated cash which was used to acquire resources for the desired firm. In addition, the bridge business was most often run part-time while the entrepreneur devoted time and energy to developing the other business.

Personal resources used for business purposes constitute the last factor influencing resources at startup and the degree of outsourcing after startup. This strategy reduced the drain on the firm's assets and allowed the entrepreneur to make investments in other resources. Furthermore, when entrepreneurs delayed taking salaries from the business, these personal assets could be invested back into the business.

4. PROPOSITIONS

The model in Figure 17 presents a richer view of the resource acquisition strategies of entrepreneurs. Furthermore, the data suggests that two different sub-groups of entrepreneurs may exist: those who encounter favorable transition situations and those who encounter unfavorable ones. Lastly, the revised model suggests some propositions to aid future research in this area.

> Proposition 1. The pre-startup resource acquisition strategies used by an entrepreneur is dependent on how favorable the transition situation is between the time the entrepreneur seriously begins to consider starting his own business and actually begins operations as an independent business owner.

Entrepreneurs often begin assembling resources, especially information, for starting a business when they are employed by other organizations. Characteristics of the organization, characteristics of the entrepreneur's position in that organization, and characteristics of the entrepreneur's personal life can facilitate or hinder resource acquisition in the pre-venture period.

Characteristics of the Organization

Public sector organizations, like universities and national laboratories, are often supportive of regional

business development. Some government-supported public sector organizations have mandates to develop programs which foster and encourage entrepreneurial activity.

Other private sector organizations may, in their own self interest, support the entrepreneurial aspirations of their employees. Some organizations may view local economic development and growth as beneficial to all businesses in a region. Others may have a business unit that no longer fits the scope of their operations and may encourage the entrepreneurial aspirations of employees to divest themselves of this unwanted unit.

Public and private sector organizations like those above have reasons to support employees who want to start their own businesses, and these organizations are able to facilitate the pre-venture and startup process. This help can take many forms: time off from current job duties to engage in pre-venture activities, help with financing, and policies which facilitate technology transfer from the parent organization. Employees in organizations like these face favorable transition situations and will use certain resource acquisition strategies rather than others (The strategies that entrepreneurs in favorable and unfavorable transition situations will likely use is discussed more thoroughly in Propositions 2, 3, and 4.).

Other organizations do not encourage the entrepreneurial aspirations of employees. Some do not

want technology to be transferred from the organization (via the intellectual capital of the technologist-entrepreneur) before the organization can reap the economic benefits of that technology.

For some private sector organizations, employees who start their own businesses become direct competitors. Employees have access to business ideas and know-how and, perhaps, even client lists or loyalty. Firms in these instances try to hinder the entrepreneurial activities of employees. Employees in organizations like these are faced with unfavorable transition situations.

Characteristics of the Entrepreneur's Position

Some employees are loosely supervised professionals who set their own schedules. The organization is more concerned with the output of these employees than with their methods, schedules, or work hours. These people are free to engage in pre-startup activities, like resource acquisition, as long as it does not interfere with the employee's duties in the parent organization. This represents a favorable transition situation.

Other employees have jobs with inflexible schedules and designated duties. Aspiring entrepreneurs with jobs like these are not free to use business hours for entrepreneurial activities and must use the less favorable

hours on weekends and evenings. This represents an unfavorable transition situation.

Characteristics of the Entrepreneur's Personal Life

Entrepreneurs who have savings, other sources of income, or a working spouse also face favorable transition situations. These individuals are able to stop working for their previous employers to devote full-time to pre-venture resource acquisition and other startup activities.

Other individuals who support themselves or families must continue working before starting a new venture. Some of these entrepreneurs work at the new business part-time and after hours, until the business generates enough revenue to support the entrepreneur and her family. This latter situation is less favorable.

> Proposition 2. Entrepreneurs with favorable transition situations will engage in extensive pre-venture searches for resources, especially information.

Entrepreneurs in favorable transition situations have time to engage in pre-venture activities including resource acquisition. These entrepreneurs are able to obtain as much information and knowledge as they think they will need to start and run a business. These entrepreneurs are also able to secure necessary equipment.

With extensive time for planning and resource acquisition, such entrepreneurs start businesses that are ready to begin operations as soon as they open their doors.

> Proposition 3. Entrepreneurs with limited resources will take on partners with complementary and needed resources.

Entrepreneurs who lack the resources needed for the new venture can acquire them by choosing partners who have the needed resources. This is a strategy which saves time and money. An entrepreneur with technical knowledge, but no business knowledge, can acquire a partner with business knowledge. An entrepreneur should be able to shorten his own learning curve by benefiting from a knowledgeable partner.

> Proposition 4. Entrepreneurs in unfavorable transition situations will delay the start of the businesses of their choice by starting bridge businesses.

The aspiring entrepreneur in an unfavorable transition situation is on the horns of a dilemma. He cannot work on pre-venture activities due to constraints imposed on him by his employer. Yet he cannot quit his job and start a new business because (1) he needs the job for financial support; (2) he has no resources to start a

business; or (3) even if he had resources to start the business, the business would probably not provide him with an income for an extended period.

The bridge business provides a solution to this dilemma. The bridge business requires almost no resources to start and generates cash in excess of that needed to sustain operations. It allows the entrepreneur to (1) quit his job, (2) have an income, and (3) begin acquiring resources to start the business he really wants to be in.

> Proposition 5. Transfers of information from parent or incubator organizations are the most commonly used pre-venture resource acquisition strategies.

In every company in the study, the entrepreneur transferred considerable know-how from the parent (or incubator) organization. Aspiring entrepreneurs learned about managing people and money by working in other organizations. Aspiring entrepreneurs transferred technology from their parent organizations as well, most often as their own intellectual capital. Technology gets transferred through people, especially through the people who were instrumental in developing it.

> Proposition 6. The degree of outsourcing used by a firm in the early years after startup is a function of the resources available at startup.

The resources available at startup determine what resources are needed during the first year. Those firms founded by entrepreneurs who did extensive pre-venture resource acquisition have extensive resources inhouse. These firms have little need to outsource.

> Proposition 7. The firms of founders who had favorable transition situations will achieve firm milestones earlier than firms with unfavorable transitions situations.

Favorable transition situations allow entrepreneurs to have resources in place prior to startup. This means that at startup, the firm is ready to produce products immediately. These firms have knowledge about target markets and can begin marketing activities. Such firms should have a head start toward milestone achievement.

CHAPTER VI

SUMMARY, LIMITATIONS, AND CONTRIBUTIONS

1. SUMMARY

The resource acquisition strategies of entrepreneurs were examined quantitatively and qualitatively. Emphasis was placed on the strategy of outsourcing which was characterized by the efficient use of a resource acquired using short term, recurring expense which minimized drain on the firm's assets. A general hypothesis was tested for five different kinds of resources including technical information, marketing information, financial information, general management information, and equipment. The hypothesis suggested that, given equal startup complexity, firms which utilize a high degree of outsourcing would reach firm milestones faster than firms with less outsourcing.

The relationship was shown to be statistically significant for technical and marketing information but in the direction opposite from that predicted and for financial information in the direction predicted. A multiple regression model with Degree of Outsourcing for Technical, Marketing, and Financial Information explained about 16% of the variance in Time to First Sale. Also,

qualitative data revealed entrepreneurs used many pre-venture strategies which influence the amount of outsourcing used after startup.

Several generalized resource acquisition strategies were discovered in the qualitative portion of the study. These included pre-venture searches, partners with resources, transfers from parent and incubator organizations, bridge businesses, and the use of personal resources for business purposes.

The quantitative and qualitative findings were merged into a new expanded model of the resource acquisition strategies of entrepreneurs (Figure 17, 132). Several propositions were suggested to test the tenets of the model.

2. LIMITATIONS

The research has limitations involving sampling considerations. The sample was small, regional, and limited to technology-based firms. Will the findings or proposed model apply to new firms that are not technology-based? Another limitation, due to the highly technical nature of the firms, is that not all resources were equally available in all transactional forms. Much of the equipment was developed inhouse because it was simply unavailable from other sources. Furthermore, most firms

had expert technologists inhouse and had no need to look elsewhere for technical information.

The fact that so many firms had considerable resources in place prior to startup resulted in very little variance in Degree of Outsourcing. This made finding significant results for the hypothesized relationships difficult. This study further emphasizes the difficulty in determining when a firm began, since so many activities occur before the firm actually started operating or established boundary.

The measurement of Degree of Outsourcing is another limitation of this study. T-tests of the scale values used in the measurement of this variable indicated that not all the scale anchors were statistically different from each other.

3. CONTRIBUTIONS AND IMPLICATIONS FOR FUTURE RESEARCH

Like all research, this study was built on the work of others and began with the idea that using outside resources should have a positive impact on the performance of new firms. While the attempt to measure outside resources was not wholly successful, in the process of this study, as in the process of science, interesting findings emerged. Our understanding of resources acquisition improved. This research has led to the

formulation of a new, more complex model and the suggestion of several propositions to test this model.

This research also makes a contribution to future researchers who may want to study outsourcing by new startups. The findings suggest that resource acquisition, including outsourcing strategies, often begins several years before the firm begins operations. Future researchers will need to collect data on outsourcing during the pre-venture years. Future researchers may also want to focus on outsourcing in the early years beyond year one, perhaps during years two through five. It appears that the first year of operations may not be a good time to study outsourcing strategies. In addition, rather than focusing on resources needed for operations, future researchers may want to study the degree of outsourcing for resources which were not available at startup.

This research has also contributed to the understanding of the startup process of new businesses especially to a better appreciation of the transition period just prior to the establishment of the firm. The research presents a rich picture of how entrepreneurs actually acquire resources during this transition period as well as during the early development of the firm. The importance of the favorableness of the transition period, in terms of how easily the entrepreneur can engage in pre-

venture activities, including resource acquisition, has been highlighted by this study.

Another significant finding is the concept of the bridge business which is undocumented in the entrepreneurship literature. Does this organizational form occur in other than technology-based startups? Answering this question presents another avenue for research.

Another important finding is the large amount of technology which is transferred through people. Licensing or other formalized, legal transfers were seldom used to obtain technical information. In the rare instances when formal transfers of technology occurred, the entrepreneur had generally played an important role in its development; the licensing was a necessary legality. In this sample, founders established technology-based firms on their own intellectual capital. Discovering whether this phenomenon occurs in other populations presents another opportunity for research.

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APPENDICES

APPENDIX A

OAK RIDGE AREA QUESTIONNAIRE

THE UNIVERSITY OF TENNESSEE

OAK RIDGE AREA QUESTIONNAIRE

The purpose of this study is to access the impact of the Oak Ridge Federal Facilities on local business startups and subsequent business development. We hope to do so by tracking the direct and indirect contributions made by Oak Ridge Federal Facilities (ORFF) to the startup and development of businesses in the Knoxville - Oak Ridge area. These Oak Ridge Federal Facilities include ORNL, Y12, K25 and DOE. The information you provide will be used by researchers at the University of Tennessee and by members of the Office of Technology Applications at ORNL.

The information on the white pages of the questionnaire will be held in strictest confidence and will only be reported in aggregate form with data from other participating firms. The information on the cream colored pages at the end of the questionnaire will be used to assist the Office of Technology Applications in designing better programs for technology transfer.

We anticipate that it will require about thirty minutes to complete the four parts of this questionnaire.

Part I: Support Your Firm Received From Other Firms:

Did your company obtain scientific/engineering information, physical resources, business information, or people from ORFF or other firms? What difficulties did your firm have in obtaining needed resources?

Part II: Support Your Firm Provided to Other New Ventures:

Did your firm or personnel from your firm contribute to the startup of any other companies?

Part III: Firm Data:

We need to have some specific financial and operating information in order to understand the growth patterns of your firm and other local startups.

Part IV: Technology Transfer:

This section deals exclusively with technologies transferred by the Oak Ridge Federal Facilities (ORFF) to local firms. Only firms which have attempted such transfers need answer this part of the questionnaire. This material will be used by the Office of Technology Applications to establish future transfer policies.

Please answer the following questions to the best of your ability. If you have any questions please call the University of Tennessee Center for New Venture Analysis at 974-1739 from 9 A.M. to 4 P.M. Monday through Friday.

Q 101-102 YOUR NAME AND POSITION _____

Q 103 COMPANY NAME _____

Q 104 ADDRESS _____

Q 105 TELEPHONE NUMBER _____

PART I: SUPPORT YOUR FIRM RECEIVED FROM OTHER FIRMS

SCIENTIFIC/ENGINEERING INFORMATION

The transfer of scientific or engineering information to a business start-up can take many forms. This transfer can occur informally (for example, know-how gained by working for an organization, discussions with scientists or engineers, or access to scientific papers) or formally (for example, the licensing of technology). Please consider both informal and formal routes of information transfer when you answer the questions below.

Q 106-121 For each type of scientific/engineering information listed below, please circle a number to indicate how important each type of information from each source was to the startup or development of your company. If you did not receive a type of scientific/engineering information from a source, please respond NONE RECEIVED.

IMPORTANCE OF SCIENTIFIC/ENGINEERING INFORMATION

	None Received	Not At All Important	Not Very Important	Somewhat Important	Very Important	Critically Important
A. BASIC PRODUCT RESEARCH INFORMATION:						
Q 106 FROM ORFF*	none	1	2	3	4	5
Q 107 FROM OTHER LOCAL FIRMS	none	1	2	3	4	5
Q 108 FROM NON-LOCAL FIRMS	none	1	2	3	4	5
Q 109 DEVELOPED IN-HOUSE	none	1	2	3	4	5
B. APPLIED PRODUCT DEVELOPMENT INFORMATION:						
Q 110 FROM ORFF*	none	1	2	3	4	5
Q 111 FROM OTHER LOCAL FIRMS	none	1	2	3	4	5
Q 112 FROM NON-LOCAL FIRMS	none	1	2	3	4	5
Q 113 DEVELOPED IN-HOUSE	none	1	2	3	4	5
C. BASIC PROCESS RESEARCH INFORMATION:						
Q 114 FROM ORFF*	none	1	2	3	4	5
Q 115 FROM OTHER LOCAL FIRMS	none	1	2	3	4	5
Q 116 FROM NON-LOCAL FIRMS	none	1	2	3	4	5
Q 117 DEVELOPED IN-HOUSE	none	1	2	3	4	5

	None Received	Not At All Important	Not Very Important	Somewhat Important	Very Important	Critically Important
D. APPLIED PROCESS DEVELOPMENT INFORMATION:						
Q 118 FROM ORFF*	none	1	2	3	4	5
Q 119 FROM OTHER LOCAL FIRMS	none	1	2	3	4	5
Q 120 FROM NON-LOCAL FIRMS	none	1	2	3	4	5
Q 121 DEVELOPED IN-HOUSE	none	1	2	3	4	5

*Oak Ridge Federal Facilities.

EQUIPMENT

Q 122-133 It is possible that you were loaned, given, purchased or had access to equipment (for example, access to an ORNL User Facility) that was important to the startup or development of your firm. For each type of equipment listed below, please circle a number to indicate how important each type of equipment from each source was to the startup or development of your company. If you did not acquire or have access to a type of equipment from a source please respond NONE RECEIVED.

IMPORTANCE OF EQUIPMENT

	None Received	Not At All Important	Not Very Important	Somewhat Important	Very Important	Critically Important
A. R&D EQUIPMENT:						
Q 122 FROM ORFF	none	1	2	3	4	5
Q 123 FROM OTHER LOCAL FIRMS	none	1	2	3	4	5
Q 124 FROM NON-LOCAL FIRMS	none	1	2	3	4	5
Q 125 DEVELOPED IN-HOUSE	none	1	2	3	4	5
B. PRODUCTION EQUIPMENT:						
Q 126 FROM ORFF*	none	1	2	3	4	5
Q 127 FROM OTHER LOCAL FIRMS	none	1	2	3	4	5
Q 128 FROM NON-LOCAL FIRMS	none	1	2	3	4	5
Q 129 DEVELOPED IN-HOUSE	none	1	2	3	4	5

	None Received	Not At All Important	Not Very Important	Somewhat Important	Very Important	Critically Important
C. OTHER EQUIPMENT: (Please specify)_____						
Q 130 FROM ORFF	none	1	2	3	4	5
Q 131 FROM OTHER LOCAL FIRMS	none	1	2	3	4	5
Q 132 FROM NON-LOCAL FIRMS	none	1	2	3	4	5
Q 133 DEVELOPED IN-HOUSE	none	1	2	3	4	5

BUSINESS INFORMATION

Q 134-149 For each type of business information listed below, please circle a number to indicate how important each type of business information from each source was to the startup or development of your company. If you did not receive any business information from a source, please respond NONE RECEIVED.

IMPORTANCE OF BUSINESS INFORMATION

	None Received	Not At All Important	Not Very Important	Somewhat Important	Very Important	Critically Important
A. MARKETING INFORMATION						
Q 134 FROM ORFF*	none	1	2	3	4	5
Q 135 FROM OTHER LOCAL FIRMS	none	1	2	3	4	5
Q 136 FROM NON-LOCAL FIRMS	none	1	2	3	4	5
Q 137 DEVELOPED IN-HOUSE	none	1	2	3	4	5
B. FINANCIAL INFORMATION:						
Q 138 FROM ORFF*	none	1	2	3	4	5
Q 139 FROM OTHER LOCAL FIRMS	none	1	2	3	4	5
Q 140 FROM NON-LOCAL FIRMS	none	1	2	3	4	5
Q 141 DEVELOPED IN-HOUSE	none	1	2	3	4	5

	None Received	Not At All Important	Not Very Important	Somewhat Important	Very Important	Critically Important
C. PRODUCTION INFORMATION:						
Q 142 FROM ORFF*	none	1	2	3	4	5
Q 143 FROM OTHER LOCAL FIRMS	none	1	2	3	4	5
Q 144 FROM NON-LOCAL FIRMS	none	1	2	3	4	5
Q 145 DEVELOPED IN-HOUSE	none	1	2	3	4	5
D. GENERAL MANAGEMENT INFORMATION:						
Q 146 FROM ORFF*	none	1	2	3	4	5
Q 147 FROM OTHER LOCAL FIRMS	none	1	2	3	4	5
Q 148 FROM NON-LOCAL FIRMS	none	1	2	3	4	5
Q 149 DEVELOPED IN-HOUSE	none	1	2	3	4	5

KEY PEOPLE

Typically many individuals contribute to the start-up (the time preceeding and during the first twelve months of operation) and subsequent development of a new business. We are interested in exploring who these people were and the roles they played in your company. In dealing with this question, please follow these steps.

Q 200

(a) In the NAME column below, please list by name all key individuals who played a significant role in the start-up and/or subsequent development of your company.

(b) In the ROLE(S) column, use the category numbers in the box below on the left to indicate all role(s) played by each individual. (Please list as many roles for each individual as appropriate.)

(c) In the EMPLOYER column, use the category letters in the box below on the right to indicate the employer of these individuals just prior to or at the time they were involved with your organization.

(d) In the fourth column, please circle YES or NO to indicate whether these key people ever worked for ORFF.

(e) In the next to last column, please circle YES or NO to indicate whether these key people were involved at startup (preceeding or during the first twelve months of operation).

(f) In the last column, please circle YES or NO to indicate whether the key people were involved after startup.

ROLES IN YOUR COMPANY			EMPLOYERS
1. MANAGER	4. ACCOUNTANT	7. SOURCE OF DEBT CAPITAL	A. ORFF
2. BUSINESS ADVISOR	5. LAWYER		B. OTHER LOCAL FIRMS
3. SCIENTIFIC OR ENGINEERING ADVISOR	6. SOURCE OF EQUITY CAPITAL	8. OTHER (specify on back)	C. NON-LOCAL FIRMS

NAME	ROLE(S)	EMPLOYER	EVER EMPLOYED BY ORFF?		INVOLVED DURING STARTUP?		INVOLVED AFTER STARTUP?	
______	______	______	YES	NO	YES	NO	YES	NO
______	______	______	YES	NO	YES	NO	YES	NO
______	______	______	YES	NO	YES	NO	YES	NO
______	______	______	YES	NO	YES	NO	YES	NO
______	______	______	YES	NO	YES	NO	YES	NO
______	______	______	YES	NO	YES	NO	YES	NO
______	______	______	YES	NO	YES	NO	YES	NO
______	______	______	YES	NO	YES	NO	YES	NO
______	______	______	YES	NO	YES	NO	YES	NO
______	______	______	YES	NO	YES	NO	YES	NO
______	______	______	YES	NO	YES	NO	YES	NO

PROBLEMS

Q 300-307 We want to learn more about the problems you may have encountered in your relationships with ORFF. Please circle a number to indicate the difficulty of any problems you encountered with ORFF in each of the activities listed below. If your company did not attempt to engage in one of the activities listed below circle NOT APPLICABLE (N.A.) If your company never attempted to utilize a technology from ORFF, please check the box below and then go to questions 308-318 on page 9.

Q 300 My company never attempted to utilize any ORFF technology. (Please check box.) ☐

DIFFICULTY OF PROBLEMS WITH ORFF

ACTIVITY:	Not Applicable	Not At All Difficult	Not Very Difficult	Somewhat Difficult	Very Difficult	Extremely Difficult
Q 301 OBTAINING DOE WAIVER OF INTELLECTUAL PROPERTY RIGHTS FROM ORFF	N.A.	1	2	3	4	5
Q 302 RESOLVING CONFLICT OF INTEREST ISSUES WITH ORFF	N.A.	1	2	3	4	5
Q 303 OBTAINING TECHNICAL CONSULTING FROM ORFF	N.A.	1	2	3	4	5
Q 304 BORROWING ORFF EQUIPMENT	N.A.	1	2	3	4	5
Q 305 USING ORFF EQUIPMENT	N.A.	1	2	3	4	5
Q 306 ENTERING INTO COLLABORATIVE RESEARCH AGREEMENTS WITH ORFF	N.A.	1	2	3	4	5
Q 307 OTHER (please specify) _____	N.A.	1	2	3	4	5

Q 308-318 Please circle a number to indicate the overall difficulty of any problems you encountered when performing each of the following activities. If your company did not attempt to engage in one of the activities listed below circle NOT APPLICABLE (N.A.). (This question should be answered by all respondents.)

DIFFICULTY OF PROBLEMS

ACTIVITY:	Not Applicable	Not At All Difficult	Not Very Difficult	Somewhat Difficult	Very Difficult	Extremely Difficult
Q 308 HIRING OR RETAINING SUITABLE EMPLOYEES	N.A.	1	2	3	4	5
Q 309 DESIGNING OR DEVELOPING PRODUCTS OR SERVICES	N.A.	1	2	3	4	5
Q 310 DISTRIBUTING PRODUCTS OR SERVICES	N.A.	1	2	3	4	5
Q 311 MARKETING PRODUCTS OR SERVICES	N.A.	1	2	3	4	5
Q 312 PRODUCING PRODUCTS OR SERVICES	N.A.	1	2	3	4	5
Q 313 ACQUIRING RAW MATERIALS	N.A.	1	2	3	4	5
Q 314 FINANCING THE COMPANY	N.A.	1	2	3	4	5
Q 315 ACQUIRING SCIENTIFIC OR ENGINEERING TECHNOLOGY	N.A.	1	2	3	4	5
Q 316 OBTAINING CONSULTING ASSISTANCE	N.A.	1	2	3	4	5
Q 317 OTHER (please specify) _____	N.A.	1	2	3	4	5
Q 318 OTHER (please specify) _____	N.A.	1	2	3	4	5

PART II: SUPPORT YOUR FIRM PROVIDED TO OTHER NEW VENTURES

This section concerns any contributions your company may have made to the startup or development of any other companies. There are many ways for one company to contribute to the startup or development of another: employees may start another business; a successful investor in one business may invest in another; the principals in one business may serve as formal or informal advisors to another; or some product or service may be licensed, spunoff, subcontracted, etc. to another business.

Q 400 Please identify by name those individuals associated with your firm who also played significant roles in other Knoxville-Oak Ridge startups before, during or after their association with your firm. Please list the name of the firms(s) to which a contribution was made.

NAME OF ASSOCIATE OF YOUR FIRM	FIRM(S) CONTRIBUTED TO

Q 500 If your firm contributed technology, products or services to foster the startup of other companies in the Knoxville-Oak Ridge area during or after your firms' existence, please identify the nature of the items passed on and name the firms which received them. (Please omit routine sales to other companies.)

ITEM PASSED ON	RECIPIENT FIRM(S)

PART III: FIRM DATA

Q 600-611 In the spaces provided, please estimate roughly what percent of your firm's revenues are generated through each of the categories below at the present time and the most likely percent for your business in the long run.

SALES GENERATED BY

		SERVICES		MANUFACTURING		
Q 600-601	MOST RECENT YEAR OF OPERATIONS	_____ %	+	_____ %	=	100%
Q 602-603	IN FIVE YEARS	_____ %	+	_____ %	=	100%

SALES OF GOODS AND SERVICES TO:

	INDUSTRIAL SECTOR		GOVERNMENT SECTOR		CONSUMER SECTOR		
Q 604-606 MOST RECENT YEAR OF OPERATIONS	_____	+	_____ %	+	_____ %	=	100%
Q 607-609 IN FIVE YEARS	_____	+	_____ %	+	_____ %	=	100%

SALES OF GOODS AND/OR SERVICES YOU WOULD CONSIDER:

		HIGH TECH**		LOW TECH		
Q 610-611	MOST RECENT YEAR OF OPERATIONS	_____ %	+	_____ %	=	100%
Q 612-613	IN FIVE YEARS	_____ %	+	_____ %	=	100%

**High tech goods and services are those for which specialized production or application technology, not widely disseminated, offers some important competitive advantage.

Answers to the following questions will allow us to place your company in the proper time sequence with other companies and will help us understand the overall startup and early development patterns of local companies.

Q 614 When did your firm complete its first official accounting year? 19 ___

Q 615 When did your firm pay its first full-time employee? 19 ___

Q 616 When did your firm record its first sale of a product or service? 19 ___

Q 617 When did your firm record its first profitable fiscal year? 19 ___

Q 618 If your firm is no longer in business, when did it cease operations? 19 ___

Q 619 What was your firm's payroll in its last accounting year? $ _____

Q 620-639 One way to understand the growth patterns of local businesses, is to measure your firm's sales revenue and number of full time equivalent employees at various times in the life of your company. Be sure to enter the date for each column under the column heading. If your company is no longer in business, please use the column for "Last Accounting Year" to record the information for the last year of business.

	FIRST ACCOUNTING YEAR	SECOND ACCOUNTING YEAR	THIRD ACCOUNTING YEAR	LAST ACCOUNTING YEAR
Q 620-623	19 _____	19 _____	19 _____	19 _____
Q 624-627 SALES	$ _____	$ _____	$ _____	$ _____
Q 628-631 PERCENT SALES TO ORFF	_____ %	_____ %	_____ %	_____ %
Q 632-635 PERCENT SALES TO LOCAL FIRMS	_____ %	_____ %	_____ %	_____ %
Q 636-639 NUMBER OF FULL TIME EQUIVALENT EMPLOYEES	_____	_____	_____	_____

If you are unable to answer any questions we have asked, who might be able to supply the answers?

NAME _____ PHONE NUMBER _____

PART IV: TECHNOLOGY TRANSFER

The Office of Technology Applications (OTA) at Martin Marietta Energy System has asked our cooperation in identifying technologies transferred from the Oak Ridge Federal Facilities (ORFF) to local firms. The questions below concern only those firms involved in technology transferred from ORFF. We have included several duplicate pages in case your firm transfered more than one technology from ORFF. Please use as many pages as you need. More pages can be requested by calling 974-1739 or by duplicating these blank forms.

FIRST TECHNOLOGY TRANSFER

Q 700 Please identify the technology your firm received from ORFF.

_____

_____

_____

Q 701-702 Please identify the source of the technology your firm received.

PERSON _____

DIVISION _____

Q 703-704 When did your firm receive the technology from ORFF?

MONTH _____

YEAR _____

Q 705 This technology is important to about _____% of sales in your last year of operations.

Q 706 Through what mechanism was the technology transferred?

_____ DOE WAIVER OF INTELLECTUAL PROPERTY RIGHT

_____ GRANTING OF DATA RIGHTS

_____ PURCHASE OF PATENT RIGHTS

_____ GRANTING OF PATENT RIGHTS

_____ LICENSING OF PATENT RIGHTS

_____ NON-LICENSED (NON-PATENTED) TRANSFER

SECOND TECHNOLOGY TRANSFER

Q 700 Please identify the technology your firm received from ORFF.

_____

_____

_____

Q 701-702 Please identify the source of the technology your firm received.

PERSON _____

DIVISION _____

Q 703-704 When did your firm receive the technology from ORFF?

MONTH _____

YEAR _____

Q 705 This technology is important to about _____% of sales in your last year of operations.

Q 706 Through what mechanism was the technology transferred?

_____ DOE WAIVER OF INTELLECTUAL PROPERTY RIGHT
_____ GRANTING OF DATA RIGHTS
_____ PURCHASE OF PATENT RIGHTS
_____ GRANTING OF PATENT RIGHTS
_____ LICENSING OF PATENT RIGHTS
_____ NON-LICENSED (NON-PATENTED) TRANSFER

THIRD TECHNOLOGY TRANSFER

Q 700 Please identify the technology your firm received from ORFF.

_____
_____
_____

Q 701-702 Please identify the source of the technology your firm received.

PERSON _____
DIVISION _____

Q 703-704 When did your firm receive the technology from ORFF?

MONTH _____
YEAR _____

Q 705 This technology is important to about _____% of sales in your last year of operations.

Q 706 Through what mechanism was the technology transferred?

_____ DOE WAIVER OF INTELLECTUAL PROPERTY RIGHT
_____ GRANTING OF DATA RIGHTS
_____ PURCHASE OF PATENT RIGHTS
_____ GRANTING OF PATENT RIGHTS
_____ LICENSING OF PATENT RIGHTS
_____ NON-LICENSED (NON-PATENTED) TRANSFER

APPENDIX B

INTERVIEW SCHEDULE

INTERVIEW SCHEDULE

FIRM NAME _____ FIRM NUMBER_____

RESPONDENT _____ DATE _____

Q. 1000. What do you consider your **startup date** and why?

Q. 1001. Tell me something about the **history** of your firm. How it got started and why? Who was involved?

Q. 1102. Tell me about the **products/services** you sell and to what **market.**

Q. 1103-1109. **EXPERIENCE** (YES OR NO)

SELF	OTHER FOUNDERS
SMALL BUSINESS_____	SMALL BUSINESS_____
STARTUP_____	STARTUP_____
INDUSTRY _____	INDUSTRY _____
TECHNOLOGY_____	TECHNOLOGY_____

Q. 1110. Tell me about **major transitions** in your firm.

Q. 1200. If firm is no longer in existence, what happened to assets, technology, people?

TECHNICAL INFORMATION

If you could aggregate all the technological information that was important to your firm during the first year, what percentage would you say came from each of these categories? (HAVE RESPONDENT USE SCALE CARD)

Q. 1300 - 1304.

INHOUSE DEVELOP	PAID CONSULTANT	TEAMING	LICENSED	FREE ADVICE
_____	_____	_____	_____	_____

COMMENTS:

R & D EQUIPMENT

If you could aggregate all the R&D equipment that was important to your firm during the first year, what percentage would you say came from each of these categories? (HAVE RESPONDENT USE SCALE CARD)

Q. 1340 - 1344.

INHOUSE DEVELOP	PURCHASED	RENTED	SUB-CONTRACT	LOAN	GIFT
_____	_____	_____	_____	_____	_____

COMMENTS:

PRODUCTION EQUIPMENT

If you could aggregate all the production equipment that was important to your firm during the first year, what percentage would you say came from each of these categories? (HAVE RESPONDENT USE SCALE CARD)

Q. 1350 - 1354.

INHOUSE DEVELOP	PURCHASED	RENTED	SUB-CONTRACT	LOAN	GIFT
_____	_____	_____	_____	_____	_____

COMMENTS:

MARKETING INFORMATION

If you could aggregate all the marketing information that was important during the first year, what percentage would you say came from each of these categories? (HAVE RESPONDENT USE SCALE CARD)

Q. 1360 - 1364.

INHOUSE DEVELOP	PAID CONSULTANT	TEAMING	LICENSED	FREE ADVICE
_____	_____	_____	_____	_____

COMMENTS:

FINANCIAL INFORMATION

If you could aggregate all the financial information that was important to your firm during the first year, what percentage would you say came from each of these categories? (HAVE RESPONDENT USE SCALE CARD)

Q. 1370- 1374.

INHOUSE DEVELOP	PAID CONSULTANT	TEAMING	LICENSED	FREE ADVICE
_____	_____	_____	_____	_____

COMMENTS:

GENERAL MANAGEMENT INFORMATION

If you could aggregate all the financial information that was important to your firm during the first year, what percentage would you say came from each of these categories? (HAVE RESPONDENT USE SCALE CARD)

Q. 1390 - 1394.

INHOUSE DEVELOP	PAID CONSULTANT	TEAMING	LICENSED	FREE ADVICE
_____	_____	_____	_____	_____

COMMENTS:

FIRM MILESTONES

(If can't remember month, ask for season.)

	MONTH	YEAR
Q. 1700. When did you give this firm a **name?**	_____	
Q. 1701. When did this firm have an **address** in its own name?	_____	
Q. 1702. When did this firm have a **phone number** in its own name?	_____	
Q. 1703. When did this firm have a **tax number?**	_____	
Q. 1704. When did this firm make its **first sale?**	_____	
Q. 1705. When did this firm **ship** its **first** product or deliver its first service?	_____	
Q. 1706. When did this firm **break even** financially?	_____	
Q. 1707. When did this firm first have a **positive cash flow?**	_____	

Q. 1708. When did principles of this firm start taking a **salary**? _____

Q. 1800. At startup, how much **equity** was invested in this firm?

Q. 1810. How much **debt**? Kind of debt? (e. g., Bank line of credit?)

APPENDIX C

SCALING STUDY INSTRUMENT

Name _____

RESOURCE ACQUISITION SCENARIO

Jane Doe is an aspiring entrepreneur about to start her own business. Recently she read some advice in a textbook on entrepreneurship on how to acquire resources needed for a new business startup. Knowing that she will need to acquire some manufacturing equipment, Jane realizes that she could use six different kinds of transactions. She could:

(1) have the equipment built **inhouse** by employees,
(2) **purchase** the equipment,
(3) **rent** the equipment,
(4) **subcontract** out her firm's manufacturing function to avoid purchasing the equipment,
(5) **borrow** the equipment at no cost or
(6) obtain the equipment as a **gift.**

The textbook made the following recommendations about resource acquisition:

1) Choose the lowest possible level of resource capacity to accomplish a task.
2) Avoid capital expenditures whenever possible.
3) If contracts are involved, choose a contract with the shortest possible time frame.
4) In acquiring a new resource, use as little of your firm's resources as possible.

You can help Jane Doe decide on how she will acquire the equipment needed for her firm. The exercise below is designed to help determine how well you think Jane could implement the textbook's advice in using each of the six transactions. To do this, consider each pair of transactions below. (Assume that the resource can be obtained from all the transactions equally well.)

Divide 20 points between each pair based on how well you think each transaction, when compared to the other, would allow Jane to follow the advice summarized in the box below.

For example, if you think both transactions would allow Jane to implement the advice equally well, then give 10 points to each. If you think that the first transaction would allow her to implement the advice about twice as well as the second, then give the first about 13 points and the second about 7 points. If you think that the first transaction would allow Jane to implement the advice almost completely and the second hardly at all, then give the first transaction 19 points and the second 1 point. You may not give any transaction in any pair zero points.

RESOURCE ACQUISITION ADVICE

1. Choose the lowest possible level of resource capacity to accomplish the task.
2. Avoid capital expenditures whenever possible.
3. If contracts are involved, choose a contract with shortest possible time frame.
4. In acquiring a new resource, use as little of your own resources as possible.

DEVELOP INHOUSE	_____	RENT	_____
GIFT	_____	PURCHASE	_____
RENT	_____	SUBCONTRACT	_____
PURCHASE	_____	BORROW	_____
DEVELOP INHOUSE	_____	SUBCONTRACT	_____
GIFT	_____	RENT	_____
BORROW	_____	DEVELOP INHOUSE	_____
SUB-CONTRACT	_____	PURCHASE	_____
GIFT	_____	DEVELOP INHOUSE	_____
RENT	_____	BORROW	_____
SUBCONTRACT	_____	GIFT	_____
DEVELOP INHOUSE	_____	PURCHASE	_____
SUBCONTRACT	_____	BORROW	_____
PURCHASE	_____	RENT	_____
BORROW	_____	GIFT	_____

Jane Doe will also need both technical and business information to get her business started. The information could be acquired by using five different transactions. She could:

(1) acquire the information **in-house** from her own background or from employees,
(2) pay a **consultant**,
(3) temporarily **team** up with another firm that has the information needed for a project,
(4) obtain the information from **licensing**, or
(5) get **free advice** from a friend or associate.

(Assume that the information that Jane needs could be obtained from all the sources equally well.)

Divide 20 points between each pair based on how well you think each transaction, when compared to the other, would allow Jane to follow the advice summarized in the box below.

RESOURCE ACQUISITION ADVICE

1. Choose the lowest possible level of resource capacity to accomplish the task.
2. Avoid capital expenditures whenever possible.
3. If contracts are involved, choose a contract with shortest possible time frame.
4. In acquiring a new resource, use as little of your own resources as possible.

LICENSE	_____	CONSULTANT	_____
TEAMING	_____	FREE ADVICE	_____
INHOUSE	_____	CONSULTANT	_____
TEAMING	_____	LICENSE	_____
FREE ADVICE	_____	INHOUSE	_____
CONSULTANT	_____	TEAMING	_____
FREE-ADVICE	_____	LICENSE	_____
TEAMING	_____	INHOUSE	_____
INHOUSE	_____	LICENSE	_____
CONSULTANT	_____	FREE ADVICE	_____

VITA

Mary S. Spann was born at Fort Snelling, Minnesota, and attended elementary and high schools in several states. She graduated with a Bachelor of Arts degree in chemistry from the College of St. Catherine in St. Paul, Minnesota. She then entered Iowa State University to pursue a Master of Science degree in biochemistry.

After receiving her degree, Spann worked as a research biochemist at the Philip Morris Research Center in Richmond, Virginia, for five years. Spann interrupted her career for several years to devote herself to parenting full-time. In 1979, she began work in the Biology Division of the Oak Ridge National Laboratory in Oak Ridge, Tennessee.

In 1983, she entered the M. B. A. program at the University of Tennessee and graduated in 1985. That fall, Spann entered the Doctor of Philosophy program in management at the University of Tennessee. She received the Doctor of Philosophy degree in August 1990.

Spann is a member of Phi Beta Kappa, the Academy of Management, and the Southern Management Association. She is an assistant professor in the College of Administrative Science at the University of Alabama in Huntsville.