MARKETING AND TECHNOLOGY
STRATEGY IN A "MEDIUM-TECH" STARTUP:
A MODEL FOR CONCURRENT DEVELOPMENT

by

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ABSTRACT

The computer industry is characterized by a number of successful and unsuccessful start-ups. Past studies of innovation have presented "market pull" and "technology push" models to describe the development of new products. This paper proposes a synthesized model of concurrent technology and market strategy development. This model is illustrated with a case study of a successful "medium-technology" start-up company. For this start-up firm, market needs drove the development of technology while the technology enabled the firm to achieve its market strategy.

INTRODUCTION

What is the interplay among market, technology, strategy and business considerations when launching a start-up which will rely heavily on technology? Can a firm in this situation separate marketing strategy from considerations of technology? The purpose of this paper is to propose a model of innovation that involves concurrent development of marketing and technology strategy. The paper argues that firms with technologically-based products or services must closely integrate marketing and technology strategy. The paper extends two models of innovation to propose a new model of concurrent strategy development. This model is illustrated with a case study of a "medium-technology" startup firm.

THE MODEL

There have been a number of studies of the innovation process and factors which promote it. For an economic analysis based on Schumpeter and Galbraith, see Kamien and Schwartz (1982). This reference also provides the background for the model described in this section.

Burgelman and Sayles (1986) discuss the problem of transforming invention into innovation. These authors present two models of the transformation, one driven by marketing needs and the other by technology. In Figures 1-3 which follow, numbers on the figure refer to the sequence in which events are expected to occur.

Market Driven Innovation

Market driven innovation is shown in Figure 1. Here external market needs (arrow 1 in the figure) force the organization to draw on internal and/or external knowledge (arrows 2 and 3 on the top and bottom left of Figure 1) to develop a solution to a perceived need (4). Once the need is identified, the technical staff can work on developing solutions which satisfy the needs of the external market (5).

The major problem with this model is the confusion it creates for the technical staff which may feel that it has to find a solution for a moving target. There may also be

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pressure from marketing so that a basically sound idea is burdened with too many compromises. The greatest risk, of course, is not being able to generate the technology needed to solve the problem.

Technology Driven Innovation

In technology driven innovation, depicted in Figure 2, the technology is the primary driving force in developing a product or service. Internal and external knowledge lead to a technical idea (arrows 1 and 2 on the top and bottom left of Figure 2; the technologist must develop a solution (3). The solution to the technical problem has to be marketed (4,5). The technologist must obtain support in the organization for the "invention" because he or she probably cannot display a strong market need. Funding is always a problem in the absence of a demonstrated market demand.

There are several potential problems with a technology-driven innovation. Sometimes the technologist becomes locked into a particular type of solution which turns out to be inappropriate. If there has been limited market research, a product may be designed for the unusual customer rather than the typical user.

Concurrent Technology and Market Driven Innovation

Both the market-driven innovation model in Figure 1 and the technology-driven innovation model in Figure 2 represent

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sequential as opposed to concurrent development processes. The major problems with sequential strategy development include its potential for conflict and delay. The first group, either marketing or technology, builds a stake in its work and there is a high potential for conflict when the innovation is passed on to the next group. Innovations are delayed because development takes place as a series of sequential steps rather than in parallel.

There appears to be a growing consensus in industry that many current sequential activities should be done in parallel, As an example concurrent engineering is being used in a number of industries to dramatically reduce new product development times compared with sequential product development (Business Week, 10/28/91). These efforts usually involve teams drawn from a number of functional areas; the teams include the skills necessary to develop a new product.

Kanter (1985) has argued that innovation necessitates boundary spanning in the organization. She suggests that successful entrepreneurial activity requires management by mutual adjustment rather than by command; mutual adjustment in turn requires integrative organizational structures like project teams (Kanter 1985). Results from an internal venturing data base also suggest that marketing and technology should be considered together in new ventures (Sykes, 1986). Noori (1990) discusses the integration of

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market driven (demand pull) and technology driven (technology push) and argues that the chances for success are greater if technical and market factors are considered together.

Figure 3 presents an extended model of innovation which stresses concurrent development of technology and market strategy. In Figure 3, the firm has some knowledge of the market and its needs (arrow 1). The firm is also knowledgable about technology; its internal and technical knowledge provide an understanding of how technology can enable it to solve the technical requirements needed to meet market goals (3). The start-up has to acquire technical capabilities by hiring staff members. The knowledge base of the firm enables it to solve technical problems, occasionally with the help of external parties (4). In this model, knowledge about technology allows the firm to set and achieve realistic market goals (5).

Concurrent considerations of marketing and technology reflect the close coupling between these two strategies in companies that offer a technological product or service. Concurrent activities require more coordination and greater familiarity with both marketing and technology on the part of management. The concurrent approach should result in shorter development times and fewer changes in products and services.

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THE CASE OF A MEDIUM TECH START UP

The model in Figure 3 and the case study which follows demonstrate how technology and marketing considerations are intertwined in a "medium-tech" start-up firm known as URI. Information about the company came from interviews with key staff members, attending several staff meetings, and spending a day with a major client of URI.

URI depends on the technology for its main product, but also faces severe competition and a skeptical market. Its success is due to an ability to solve technical problems while maintaining its market strategy. The model in Figure 3 describes the development of URI, a new firm that offers a data product to its customers. The past experience of the company's founders provided a good sense of the market; these entrepreneurs understood the technical issues and problems in coming up with a product for the market. A high priority was to develop the internal knowledge and skill necessary to develop a technical solution. In addition, external parties were involved for financing and to form strategic alliances to 1) provide service and 2) establish credibility with potential customers.

The Product

Figure 4 is a schematic of the product offered by URI. The company provides proprietary data to its clients. Each user of the system has a workstation on his or her desk. The

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workstation is a personal computer with a windowed interface; the system does not require a powerful personal computer needed for a windowing product like Microsoft Windows 3.0. The user can display different aspects of the data in different windows and can have the workstation notify him or her when a particular condition arises. The workstations in an office are all connected to a local area network.

The URI system also has a data machine located in a major U.S. city; the data machine takes in data from a number of providers, formats the data, and transmits it over a satellite network to customer locations. Each customer has a satellite dish on the roof to receive these data and to send messages back to the URI data base machine.

The user's office has a personal computer that is called the data server. Data from the satellite feed is directed to this server; the server in turn updates all of the local users of the data. Some users have a second server which provides office automation tools like electronic mail, word processing, presentation graphics, spreadsheet analysis, etc.

Critical Events in the Growth of URI

Table 1 is a list of the critical events in the formation of URI; the table also indicates the business, market strategy and technological significance of each

event. Table 1 is a history of the company; the model in Figure 3 has been used to interpret the events in Table 1 in the analysis that follows. Table 1 can be viewed as a case history of the start-up of this medium-technology firm.

Early History

URI came into existence because of a merger. The founder of the company worked for a firm that merged with another competitor. He did not want to work for the competitor and, after much consideration, decided to start his own firm instead of seeking another job in the industry. The founder and his staff had developed a functionally similar system using a different systems architecture at their former employer. The founder quickly gathered a core group of three other individuals whom he thought might be interested in starting URI. The group felt it possessed two key factors that would contribute to the success of a start-up firm:

1. It had a good feeling for the general market for the type of service it proposed developing,

2. It had a vision for a modern computer architecture that would make it the low-cost provider of a service with extremely high functionality.

Before the founding of URI was completed, there were several important meetings. The first of these was at the founder's apartment in which the general thrust of the business was established. A subsequent meeting at a local

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university created plans for the founder's "dream system" for the workstation.

Starting a Business

From the initial excitement over a product and marketing strategy, the next steps in the creation of URI were driven by business needs. A start-up requires funding to hire staff and develop its product. The founder had a business plan that indicated a break-even for the firm in about three years; funding was crucial to develop the product and support a marketing effort.

The contacts the founder had built in the industry, combined with the efforts of his former superior who had retired shortly before the merger mentioned earlier, helped the company locate a single source of funds for its venture. The firm offering funds would treat URI as a subsidiary and agreed to buy the firm at a specified time in the future.

Why was the funding firm eager to launch a start up? This multinational company had a number of complementary data products; it saw the URI system as a potential delivery platform for existing and planned services. The funding firm had contemplated developing a similar system; it could now invest in a firm with a highly-qualified staff and extensive experience in the area.

Early funding was crucial as URI needed to move quickly to build a design team; many of these individuals came from the founder's former employer. It was important to attract them before they left the merged firms. A minor, but time-

consuming detail, was to find suitable offices for the new venture.

Thinking About the System

With the problems above solved, the focus at URI turned to the system. There were a number of goals that grew from marketing objectives:

1) To provide low-cost leadership with high functionality,

2) To appeal to the general customer,

3) To provide an open architecture so the client could add to the system on the desktop.

These marketing objectives led to features that were important in the technical design of the system including:

1. The ability to run on a modest personal computer of the AT class. This requirement was important to being a low-cost producer; competitors were designing systems that required 386 class machines with large, expensive memories,

2. Providing DOS system windowing.

3. Pushing as much processing to the desktop as possible where it could be done with fast response times compared to existing mainframe systems (most competitors at the time used "dumb" terminals on the desktop only),

4. Providing an open architecture with great flexibility; the client could easily integrate any number of PC products with the system; he or she would not be constrained to a particular spreadsheet or word processor,

5. Offering its own data machine rather than buying a data service and distributing it. URI wanted complete responsibility for the system so that it could provide high service levels,

6. Using a two-way satellite transmission network for easy extension of the system; given the high initial

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cost of leasing satellite transponders, new customers could be added by placing a satellite dish on the roof.

URI had several critical problems to solve to achieve these technical objectives as shown in Table 1. First, the designers needed a server that would do multi-tasking. A decision was made to use the Unix operating system on the server. However, it was clear that the server for office automation would have to run a Novell network in order to provide PC-based products for the workstations. (Software for word processing, spreadsheets and other office automation functions would be resident on the office automation server, not at each workstation. Workstations would download the software from the server.)

At a conference a URI employee found a solution to let the UNIX system communicate with Novell. The choice of UNIX and the solution to the two server communication problem is estimated to have saved six months in development.

Another major event during development was a decision to use the funding firm's new communications network which featured satellite communications. URI could take advantage of this satellite network which features two-way communications, but would have to conform to the requirements of the network. URI decided to use this network for both technical reasons and political ones (to be responsive to its investor).

At this point URI formed a strategic alliance; it arranged with a national vendor to service its hardware and software in the field. Now a small firm could advertise

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nation-wide service for its products. (Such alliances are increasingly common in the computer field; a number of PC mail-order houses use the services of national firms to maintain their products.)

A Working System

URI's development effort was organized into three parts: the workstation, the network and the data machine. Each group, of course, had to meet interface requirements. The data machine had to provide the network with a stream of data. The data server had to accept these data and broadcast them to the workstations. Each workstation had to know how to interpret and display the data according to user requests.

To reduce development time, URI bought software when it appeared that it would be faster than developing it. In particular, the firm bought and modified programs to make DOS support multiple windows on the screen at the same time. It also purchased software to process data and distribute it through the data machine, though eventually URI rewrote most of this code.

A breakthrough occurred when the first data window was created on a workstation. Now URI knew it was possible to build the system it envisioned. URI could offer product demonstrations. As one employee put it, "we were never ready until the last minute to show a promised feature, but we managed to pull off the demo each time."

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The First Customers

The first customer was a small, local firm that wanted six PCs. This firm gave URI a chance to set up a complete system at a customer site and to have a place for further demonstrations. This contract was followed by one from a prestigious customer that helped URI establish credibility. The biggest challenge was a contract with a very large firm for 1500 PCs. URI extended itself to install and support all of these systems.

During 1990 URI experienced a huge increase in the number of accounts, but was leasing fewer workstations to each than originally forecast. During this time, it began to develop customers in a special niche that had not been anticipated by the founder. These niche users tended to subscribe to more services and to be more profitable than the general customer who was the original focus of the product. In late 1990 and early 1991 URI was faced with the dual problems of sustaining rapid growth and simultaneously trying to maintain its entrepreneurial atmosphere.

HAS URI BEEN SUCCESSFUL?

Figure 5 presents a graph of several key statistics describing the growth of URI during its first 36 months of business. The number of employees has increased steadily to just over 100 today. Within two years of its founding, URI began a substantial growth curve in number of installed workstations. Simultaneously, the firm began to recognize

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substantial revenue from its services. Breakeven and a profit should occur during the fourth year of operations.

Interviews with users of the system showed that the product is viewed as superior to competitors' offerings. For the same costs, the customer receives increased functionality and greater ease-of-use when URI's product is compared with the competition. One customer even featured the URI system in its annual report to show its modern approach to doing business. Given the generally high failure rate of new businesses, it seems safe to conclude that URI has had a successful first three years in business.

Key Marketing Decisions

There were a number of key marketing decisions that have been central to URI's strategy:

1. Focusing on the business the URI staff knew best,

2. Competing on cost/performance; being the low cost producer for a given level of performance; this strategy suggested an entry-level PC-AT workstation with DOS,

3. Providing better service than the competition,

4. Modifing the system to provide for special requests, e.g. helping one client update all of its processing and move it to a LAN,

5. Moving toward a new market niche where the system is concentrated physically and users tend to take more services leading to higher margins.

Some of these strategies have been suggested by others, for example, developing a superior product and entering a market where large established firms fail to compete (Dorfman,

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1987). However, URI pursued this combination of multiple strategies with a concentrated effort.

Key Technical Decisions

The key marketing decisions above interacted with the technical decisions described below. It appears that the marketing decisions had priority, but much of the marketing strategy was only possible because of the available technology and URI's expertise in exploiting it. Key technology decisions include:

1. The Workstation

   Putting information processing as close to the
   user's desk as possible
   Using the PC for its processing power, not as a
   terminal
   Using DOS for cost/performance reasons-both hardware
   and software
   Developing an open architecture so that user can add
   other packages; the system is expandable
   Including a terminal emulation window for access to
   a customer's mainframe systems

2. The LAN (local area network)

   Choosing Novell for the network
   Finding the minicomputer for the data server
   Choosing Unix for the data server
   Finding a solution for letting the server and Unix
   communicate with Novell

3. The WAN (wide area network)

   Using of two-way satellite to keep up with the
   competition and for ease of expansion
   Using terrestrial lines for customer mainframe
   access and to backup the network
   Using the funding firm's network

4. The Data Plant

   Assuming end-to-end responsibility for its system
   Choosing to purchase data plant software

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CONCURRENT DEVELOPMENT AT URI

Success Factors

For URI, the external market dictated the appropriate
level of technology and key technological decisions had to
be based on cost/performance. Marketing goals were set with
the knowledge that the technology made it possible to
implement URI's market strategy. The first keys to success
were:

1. Knowledge of the market and its needs,

2. A work force with extensive experience in the
industry and with the technology,

3. Clear market goals that were established with the
knowledge of what was technologically feasible.

4. Knowledge of the capabilities of existing
technology,

The challenge of designing a highly functional system
using modern technology with cost constraints led to the
assembly of a well-qualified, experienced technical staff.
This staff was able to design technology to meet the
marketing objectives of the firm. Additional success
factors include:

5. Expertise in the creation and management of
technology.

The need for credibility and the objective of providing
outstanding service led to strategic alliances for service
and for the network. URI was willing to buy products and

services to reduce its development time. A final success

factor then was:

> 6. URI's willingness to look outside the firm for
> solutions to problems and to form alliances with other
> organizations.

The Competition

URI faces a great deal of competition in its markets.

What advantages does it have? URI has the following

strengths in the marketplace:

> The funding firm provided backing and credibility
>
> URI formed an alliance for nationwide service
>
> URI is less expensive than competitors for equivalent
> features
>
> URI fits the existing environment due to its open
> architecture
>
> The system is designed from the customer's perspective
> by a firm that understands the business
>
> The competition has poor service

URI's competition has the following strengths:

> Some competitors have systems that address additional
> areas of processing
>
> Competitors have more existing accounts
>
> Some competitors will resort to heavy price cutting.

Challenges For the Future

URI must continually race to stay ahead of the

technology. In addition, it must develop the next

generation of its system. URI constantly has to develop

solutions for crowded workstation memory when adding new

features. The company has prototypes running unders Windows

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3.0 which should allow for the expansion of software functions at the cost of more expensive hardware. URI may also have to develop a UNIX version of the workstation to satisfy some customers. In addition it has been necessary to offer custom features to make sales; originally URI had planned to provide the same system to each customer. In competitive situations, the firm had to make special modifications that are expensive to create and maintain.

A significant challenge for URI is the fact that technological advances decrease the barriers to entry for potential competitors. Using Windows 3.0 or UNIX with a graphical user interface, a competitor can develop some of the workstation features more easily today than URI could two years ago using DOS, but at a higher cost. To sustain any kind of competitive or market advantage, URI must continue to innovate by applying new technology to enhance its products.

IMPLICATIONS

Start ups dependent upon technology need to consider the concurrent development of marketing and technology strategy. Market needs drive the technology while technology enables a market strategy. As shown in Figure 6, market and technology strategies are interdependent and need to be developed concurrently. The market suggests a certain vision for the functions and architecture of the product. The technology enables developers to achieve that product

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vision. The needs of the marketplace influence the outcome of certain technological decisions. During design, the capabilities of the design team and technology partially determine what can be offered in the marketplace.

In addition to the model in Figure 6, the URI case suggests that it helps to have experience in the market and with the technology. URI managed to hire very well-qualified staff members. By accepting the offer from its funding firm, URI was able to solve the problem of capitalization and get on with its development efforts. The firm was also willing and able to form strategic alliances at critical points in its history.

It seems safe to conclude that market and technological considerations must complement each other. For this "medium-tech" firm, it is not possible to separate one strategy from another. The founders feel for the market was probably the dominant influence as it formed the goals for the technology development effort. However, the firm established its marketing goals precisely because it knew the technology existed to make them achievable!

Referring to Figure 3, concurrent strategy development for marketing and technology made a significant contribution to the success of URI. The close integration of technology and marketing reduced the time required to develop a product and helped assure that it was responsive to the marketplace. The luxury of developing technology and marketing strategy sequentially may no longer be feasible. Concurrent

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technology and market strategy development may be necessary in the highly competitive environment of firms offering technology-based products and services.

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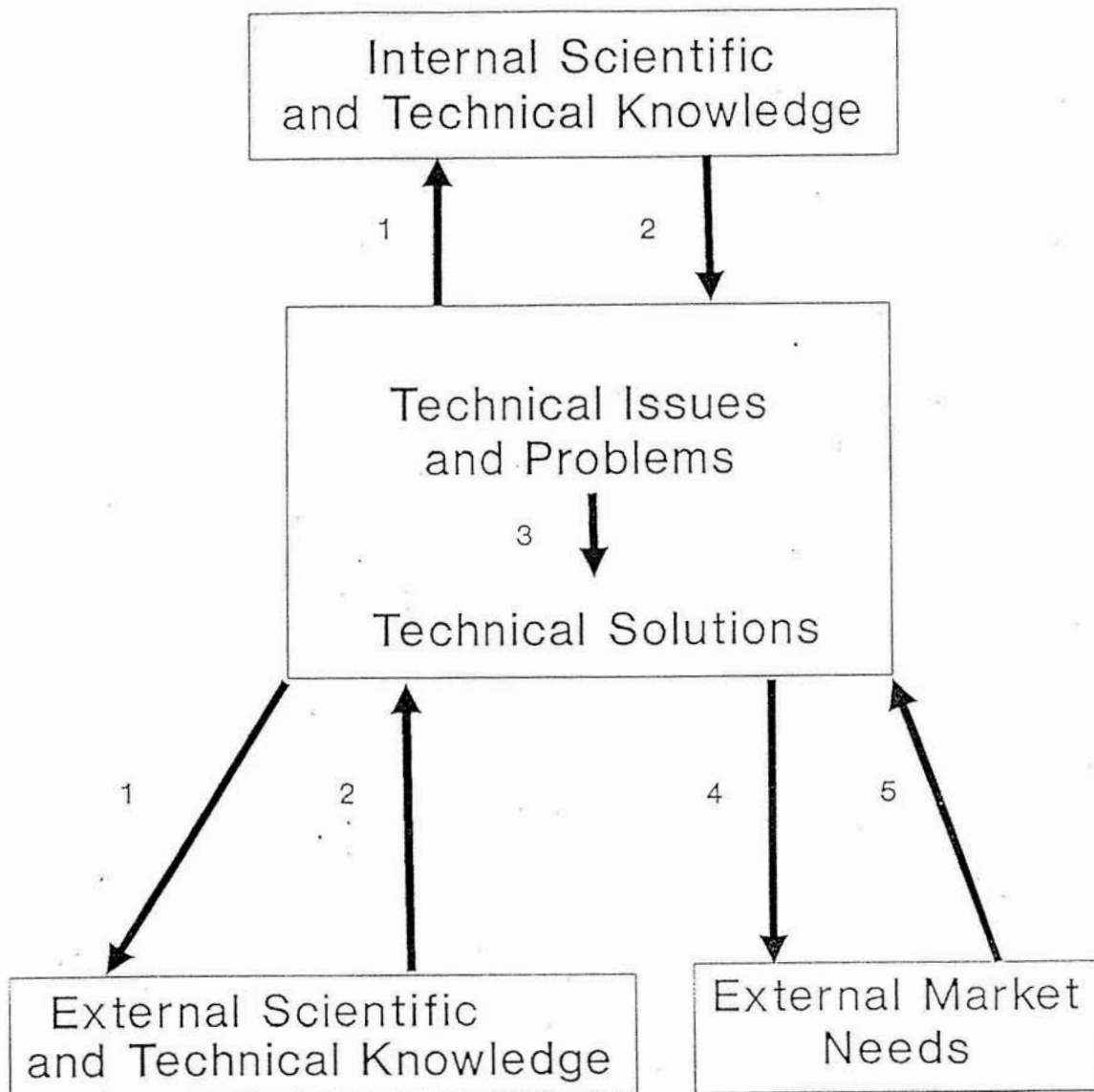
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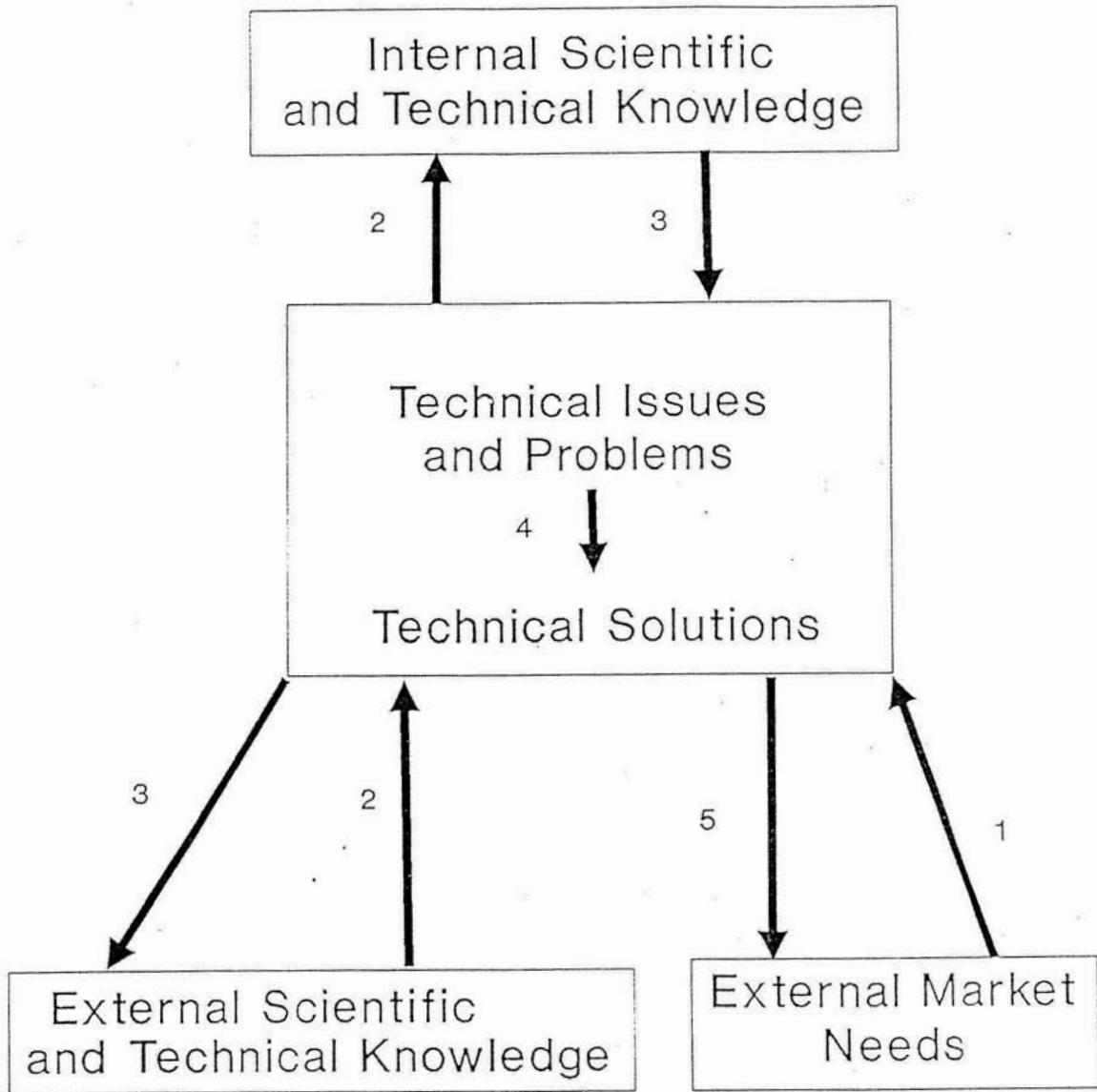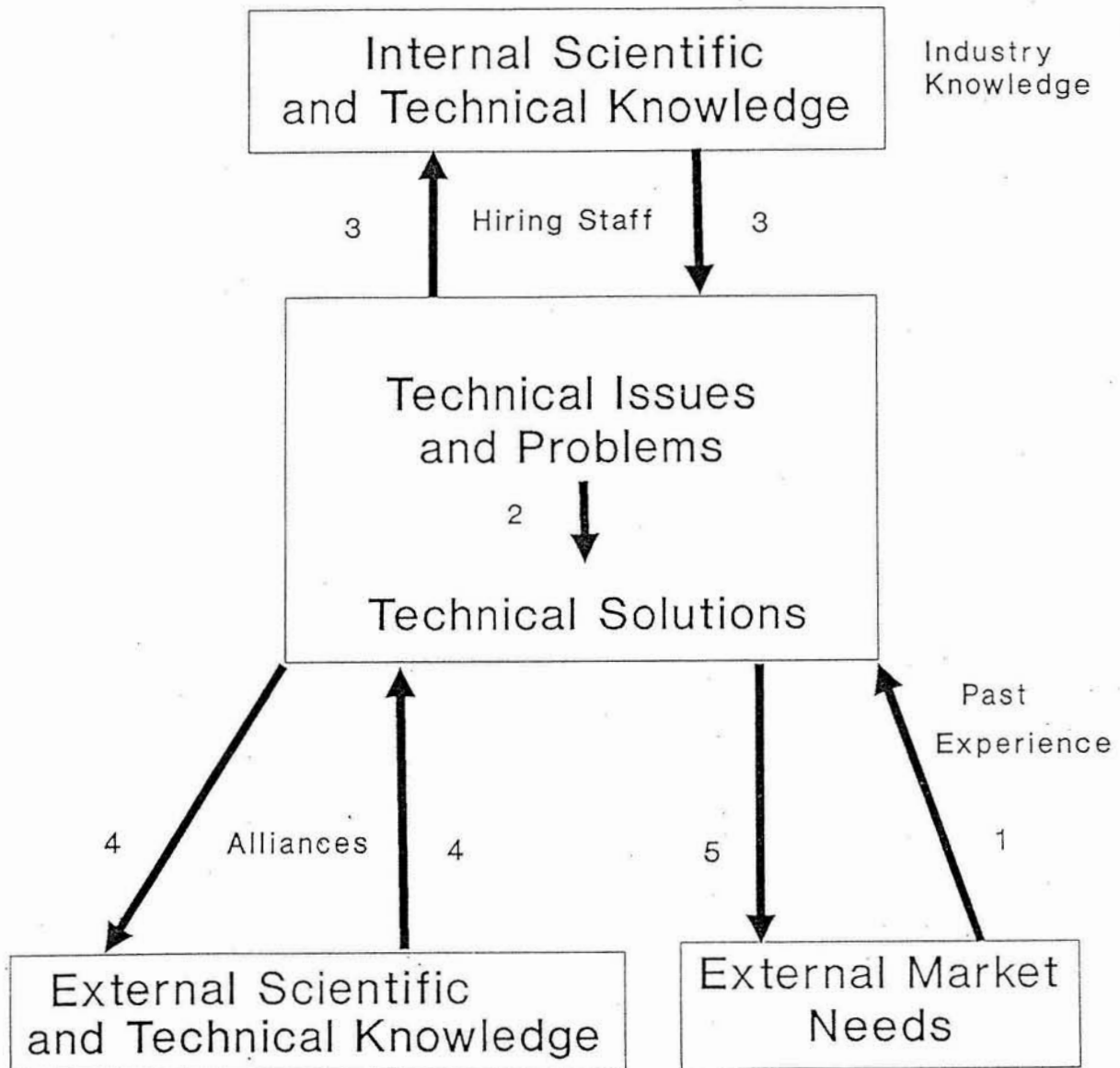
Needs Pull

Figure 1

The Evolution of Technological Strategies

Technology Push

Figure 2

The Evolution of Technological Strategies

Concurrent Strategy Development

Figure 3

The Evolution of Technological Strategies

The URI System

Figure 4
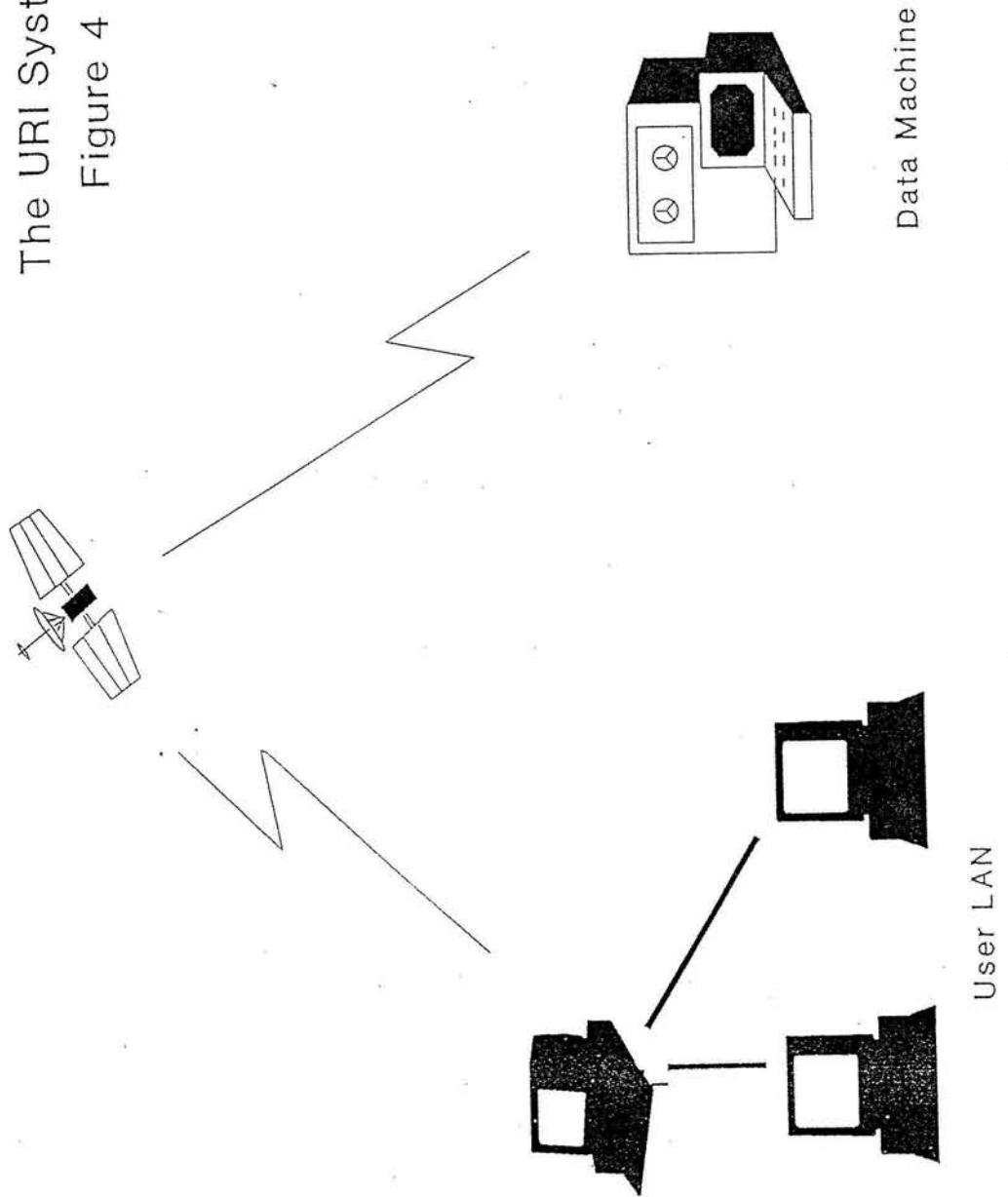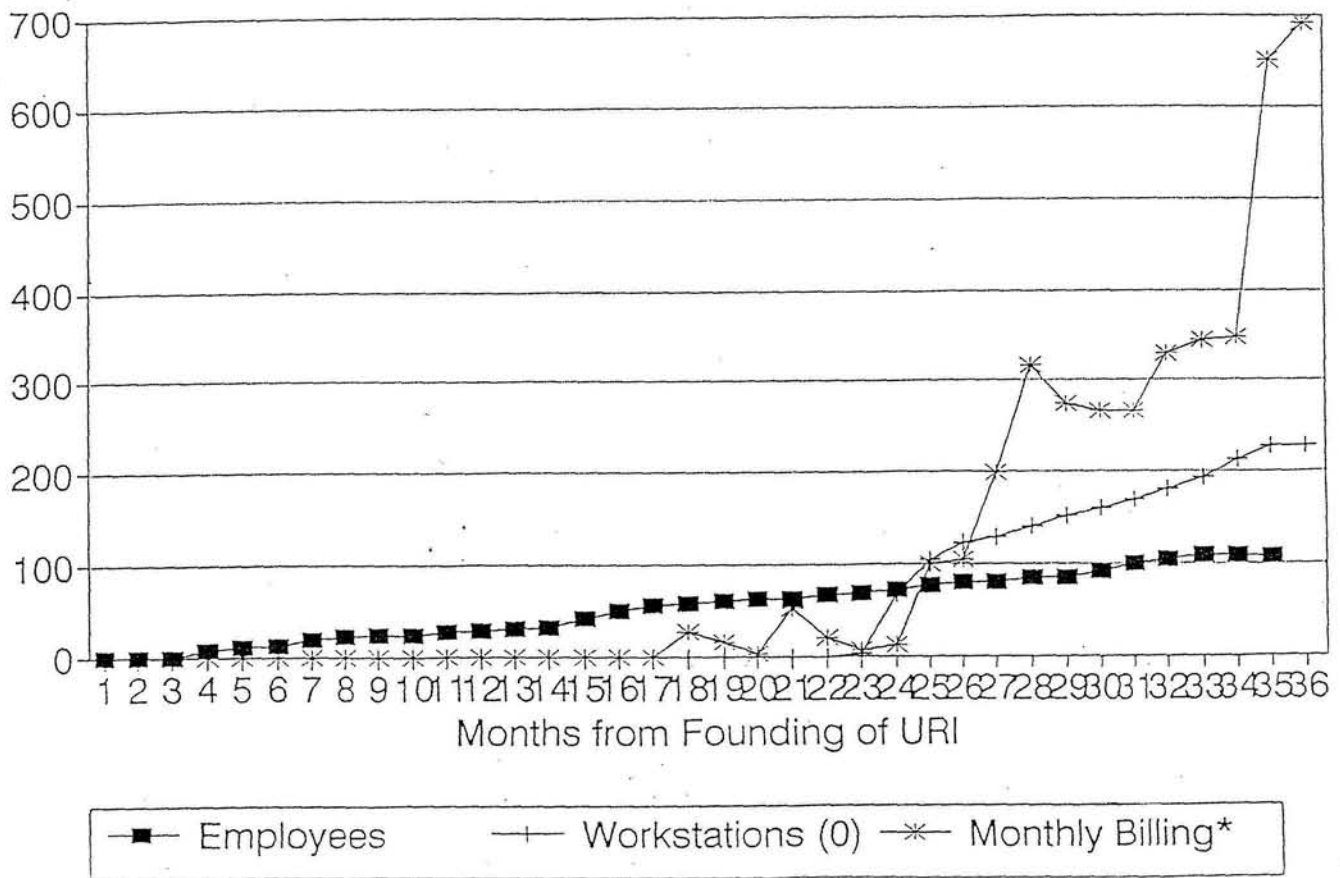
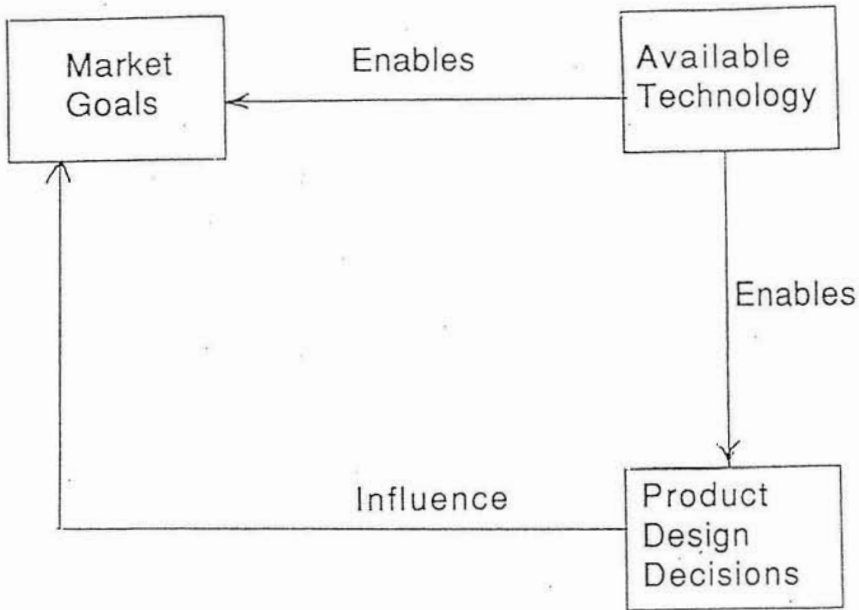Data Machine

User LAN

Figure 5: Three-Year Statistics for URI
*(Billing Data Disguised)

Months from Founding of URI

—■— Employees   —+— Workstations (0)   —*— Monthly Billing*

Interdependence of Market
and Technology Strategies

Figure 6

Critical Events in the
Growth of URI
Table 1

Critical Event	Business	Strategy Market	Technology
Former employer's system	Support general customer	General	Hierarchy
Merger of former employer	Growth	General	Common systems
Founder decides to start own business February-March Year 1	Develop system with best cost/performance	General	Modern, open, PC architecture
Meet at founder's apartment	Vision of business	General	Modern, open, PC architecture
"Dream System" University meeting March Year 1	Cost/performance	General	Workstation
Start over again -ignore predecesor's system	Avoid legal concerns	Avoid legal concerns	Newer technology offers better design
Funding April Year 1	Financing Get team together before take other jobs	Credibility	Finance development
Chairman appointed	Experience Sales	Credibility	
Put team together quickly	Strong, competent		Small, strong team
Locating offices May 1, Year 1	A business		

Architecture of data machine, LAN, workstation	Use existing systems, open architecture	General	Push processing to desk, open architecture
Overlapping windows and typing in window	Advanced system at reasonable cost	Technology leadership	Extending DOS and avoiding costly hard/soft ware
Finding mini that could be server with multi-tasking and UNIX	Saved 6 months	Known vendor	Server
Solve technical problems: UNIX-Novell LAN Multiple access	Develop demo		Make architecture work
Solve data vendor problem	Viable data machine	Needed own data machine	
Service agreement with national vendor	Credibility	Service	Hardware support
Using parent's network for communications	Existing network	Parent backing	Instant Wide-Area Network
Getting first data window going	Concept would work	A product to show	DOS multi-tasking would work
Getting a demo going	Show product	A product	Development, design, program, test
Race to get enough functionality to install at customer site	Begin installing system	A site to show	Design, program, test
Initial customer-small firm-6 PCs April Year 2	Install to show others	A site	Installation problems with

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			system
Contract with prestigious customer for 20 PCs	Two customers	Two sites	Installation problems
Contract with large customer for 1600 PCs October Year 2	Major customer	General	Size of installation
Install customer above in January and February Year 3	Major account	General	Size of installation; add unspecified data
Huge increase in number of accounts-eightfold	Seen as viable vendor	New niche	Special features, new platforms
Rapid personnel growth	Bright prospects		Modify system

Critical Events in the
Growth of URI

Table 1