Planning the Unplannable: Strategic Facility Planning Models for Turbulent Environments

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Strategic facility planning for high-tech firms requires different approaches than it does for traditional firms because of the difficulty of predicting business plans and the necessity for quick, ad-hoc management decisions.

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Introduction

This paper is based on our definition and search for a strategic facility planning model for Sun Microsystems, a very fast-growing, high-tech company. As a result of this experience, we have come to believe that high-tech business environments demand different methodologies, procedures, designs, and planning tools because of the necessity for quick, opportunistic management decisions. These differences are described in terms of the development of a strategic planning model for a typical high-tech company, Start-up, Inc.

The need for good strategic facility plans are as critical for high-tech companies as for any other company. Good planning will provide the right kind of facilities when and where they are needed in order to support the company's business. A bad plan, of course, could cause a company to delay critical business actions if facilities are unavailable or result in unacceptably high costs if facilities are overabundant. As our title implies, strategic facility planning is very difficult for high-tech firms since they are, by their very nature, unpredictable.

We believe that Sun Microsystems' strategic facility planning needs are typical of high-tech companies and that these needs are quite different from those of more traditional companies. Traditional, bottom-up planning systems are inappropriate for high-tech companies, whose facility needs are driven from top-down business goals —- such as production and sales levels —- and not from discrete staff, equipment and space requirements. While we are focused on high-tech companies, *all companies* (or at least those that will survive and thrive in these coming years) are becoming more technology-driven and will be subject to similar pressures.

What is High Tech?

The term high tech generally connotes firms that provide technology-driven products or services. Companies in the electronics, computers or genetic engineering businesses are typical examples, although others as diverse as Federal Express and L.L. Bean —- which are heavily dependent on computer technology —- also are considered high-tech firms. Sun Microsystems is known for having significant product introductions on the average of once every *six months!* These companies are also characterized by foreshortened decision-making processes with relatively flat organizations, a high rate of organizational change, very "lumpy" growth and short product cycles.

All of these characteristics add up to a very difficult strategic planning problem. The planner at Apple Computers compared facilities planning to trying to steer a 300,000-ton (330,000-m.-ton) bulk carrier through a mine field at 30 knots (56 km./hr.).

Sun Microsystems

Sun Microsystems is perhaps the classic example of a high- tech company. Sun has become the leading workstation manufacturer in the short span of six years. By using off-the- shelf parts, Sun takes advantage of technological breakthroughs as soon as they reach the market. This approach has enabled the company to double the computing speed of its computers every year. It has also driven the company's revenues from $9 million in 1983 to $538 million in 1988.

But this meteoric growth requires tremendous responsiveness by its organization and its facilities. Sun's organization is significantly changed once or more every year. Also, its facilities have grown at 50 percent per year, and its churn rate is more than 100 percent per year.

Strategic Facility Plans

Strategic facility plans define how much space is needed, what kinds of facilities are required and where facilities should be located. Typical steps involved in strategic facility planning are:

—- 1. Develop alternative facility-demand scenarios based on management policies and business plans;

—- 2. Generate optional facility strategies;

—- 3. Evaluate and select the best facility strategy by comparing the risks and benefits of each strategy with respect to the alternative facility-demand scenarios.

Alternative strategic facility plans —- which specify type, location and schedule for the provision of space —- are

evaluated in terms of each space-demand scenario.

Strategic Planning Styles

Strategic facility planning is necessarily closely tied to corporate planning overall. As you would expect, corporate planning for high-tech firms has to be more flexible and opportunistic than it is for traditional firms. Sun is no exception, and its overall planning style belongs to the more complex end of macro-scale-of-management styles —– "surprise management" —– where "turbulence" is relatively high compared to the simpler, "control" style of management. Surprise management is when the facility manager is called into the boss's office on Monday morning and is handed a "surprise" reorganization plan which will require 200 new workstations in two months. "Turbulence" reflects the rapid changes in the business environment and the adaptations made by the company in response.

In practice, at Sun Microsystems this means that corporate decisions are regularly made by a small corporate steering committee (CSC), as shown in Chart A. The success of the process, however, depends on working closely with division managers *and* service organizations, such as facilities. In the case of facilities, the CSC requires a quick response —– measured in days —– from facilities regarding the implications of the CSC's options in order to make informed decisions.

This opportunistic planning process is overlaid on a more traditional budget-planning process, which results in a plan and a budget.

Top-Down Approach

Sun's strategic facility needs are based on top-down business indicators instead of the more traditional "bottom-up" approach (see Chart B). For example, space needs for the marketing group may be a function of space per head count and head count as a percentage of projected revenues. A bottom-up approach would be based on the estimated head-count and area requirements for each type of staff and on support space for the marketing manager.

The reason for using a top-down approach is fundamental —– the bottom-up approach provides a degree of information which is not only unnecessary but probably inaccurate. The bases for developing detailed, bottom-up staff/areas projections change so rapidly in the high-tech environment that a detailed projection beyond one year is probably misleading. In general, you do not want to develop more detail than is necessary. The macro model is more accurate in the longer term, since it is based on longer- term trends and not on the opinions of managers or department heads who very likely will not be around beyond five years (or not even that long in some high-tech firms).

A case in point is Facility Technics' attempt to develop a large new research and development (R&D) center for a high-tech materials manufacturer. We were using a bottom-up model and trying to pin down the chief scientist on specific laboratory requirements in the next two, three and five years. This was exasperating for him because research, by its nature, is unpredictable. He asked, "How long is it going to be before we move in?" Our answer was about three years. With a chuckle, he said, "Do you realize that we reorganize, on the average, every six months! That means that we will have reorganized six times before we even get into the building!" The point is that you cannot rely solely on existing organization and managers to accurately predict facility needs. It is necessary to rely on other predictors that are relatively independent of fluctuating management or organizational changes.

Start-up, Inc.

We will describe the process for developing facility needs for Start-up, Inc., a typical Silicon Valley start-up. Start-up, Inc. is a subsidiary of a major telecommunications corporation. It has been established to develop and manufacture a new telephone product, based on a proprietary invention developed at the parent company. We have been requested by the controller to develop a 10-year strategic facility plan.

Business Scenarios

Often, especially if the company is new or is in transition, an apparently confusing array of opinions will be expressed in the initial planning interviews. Usually, these opinions are actually based on a far fewer number of scenarios of the company's business plan. These scenarios are based on shared beliefs regarding:

—– the image and character of facilities and work space;

—– work-space standards, including private vs. open offices;

—– the work style;

—– warehousing and distribution policy;

—– manufacturing subcontract policy —– in-house or contract;

—– local or distributed field sales and customer support offices;

—– business strategy and priorities —– new product introductions, low costs, time-to-market, product support, market share;

—– location; and

—– site distribution.

A different set of driver relationships and constants may be necessary for each scenario and phase. For example, the area/head count may change from a tight start-up of 270 net sq. ft. (25 net sq. m.)/person in phase 1 to a more generous 325 net sq. ft. (30 net sq. m.)/person in phase 2.

Based on our interviews, three basic scenarios were defined:

—– **A: Target Scenario:** Start-up will develop and sell high-volume, standardized products with long product cycles. Future products will be extensions or elaborations of the ba-

sic, existing products. Customizations will be by the use of plug-in, optional modular boards.

–– **B: Hard-Nosed Scenario:** Same as A, except that projected production goals are delayed by two years and there is only 20 percent success in implementing just-in-time (JIT) principles.

–– **C: Custom Scenario:** This scenario is based on the belief that the telecom business will become more technology driven, like the electronics/computer sector. Product volumes will be lower, with shorter cycles and more customizations.

Three phases of the start-up's growth were identified:

–– **Developmental Phase, 1988-1992:** The product is still being engineered and only test batches are produced. There are no revenues, and operating expenses come from venture funds from investors.

–– **Ramp-up Phase, 1992-1994:** Production is rapidly increased to meet projected market demands, revenues from sales start to take off, and operating expenses increase at a faster rate.

–– **Mature Phase, 1994-1997:** The start-up is producing over 4,000 units per month, with revenues of over $1.5 billion and operating expenses of about $361 million.

Drivers

The relationships which drive square-footage demands are "drivers." Drivers are basic indicators of the company or organization which are predictable over the long term and also drive or force space needs. The type of driver varies by the type of organization. Population of service areas or the number of customers drives the space needs of service organizations, such as utilities or governmental groups. Space needs for manufacturing companies are generally driven by production rates and revenues.

In the example shown in Chart C, the drivers are revenues, operational expenditures (which are a function of revenues) and production rate. Even though these drivers are based on the company's business plan, there may still be a difference of agreement concerning projected indicators –– especially in the later years –– that can be portrayed as alternative scenarios.

Ratios

Area needs of the engineering, marketing, and R&D groups (shown in Chart C) are driven by operating expenses. Area needs of these groups are a function of:

–– operating expense per head count and

–– square footage per head count.

Operating expenses per head count (HC) for each group is derived from each group's business strategies. The engineering group's ratios remain steady at about $500,000/HC, since the start-up wants steady, continued development of new extensions of the basic product. The marketing group's ratio is almost constant throughout, since the marketing effort should be directly proportional to available operating expenses. The R&D group's ratio rises sharply after the development phase, since sustained, large R&D investments are not necessary.

The square footage per head count (in gross sq. ft.) is derived from functional needs and company policies regarding space standards, support areas and amenities. In this case, some groups are presently in spaces that are too generous, while the rest are in very tight spaces. The long-range goal is to have a more equitable ratio for all groups.

The area needs of operations and quality assurance are functions of production area per unit to the number of units produced [for example, six sq. ft. (0.6 sq. m.)/units per month for the production area]. These relationships vary with the phase, the manufacturing technologies (such as JIT), the number of shifts and the failure rate.

Since the administrative group mainly services the other groups, its area needs are derived from the total head count of the other groups.

Results

As one would expect, the total head count and square footage needs increased proportionally to the revenue and production indicators.

Benchmarks

Benchmarks are general ratios, which can be compared to those of similar companies. For example, the square footage per head count is a common indicator and ranges from 300 to 400 gross sq. ft. (28 to 37 gross sq. m.) per person in the high-tech industry. Another benchmark is revenues per head count, which ranges from $500,000/HC to $150,000/HC.

Risk Evaluation

The costs and benefits of each strategy can be compared for each scenario (see Chart D). For example, a conservative strategy of leasing all space for the lowest projected square footage would result in a shortfall in the high-growth scenarios. This would necessitate leasing of additional space at premium rates.

Computer-Based Strategic Facility Planning Systems

Ideally, the strategic facility-planning model is computer- based so that results can be achieved quickly and accurately. It should be part of a facility-planning system which consists of:

–– a macro-level strategic facility-planning system for top- down facility needs and capacity analysis at a divisional group/floor area level, with a modeling language package such as Javelin or IFPS/Personal and

–– a micro-level facility planning/management system for planning and tracking facility needs and resources at the workstation/room level. The results of this model substantiates the macro-level information.

When you are pinned to the wall by the vice president of engineering to explain why he cannot have an additional 50,000 sq. ft. (4,645 sq. m.) in the next quarter because he has sufficient slack space, you better be able to substantiate it! If you do not have a micro model, you may find yourself and your staff spending the next week and weekend manually inventorying the engineering group's space.

The bottom-up model (see Chart B) is necessary to validate the top-down model. Since it is based on finer-grained information about actual area allocations, it more accurately represents *existing and near-term* conditions than the macro model. The bottom-up model is the starting point of the macro model, and it is used to make certain that existing conditions and near-term projections of that model are realistic.

These two models should be interfaced to exchange information, to avoid duplication and to avoid data inconsistencies. Ultimately, it is desirable to extend the micro-level system to include the macro-level model so that they can share a common database.

Planning and Design Ramifications

The demands of the high rate of change have resulted in the evolution of commonly shared planning and design practices among high-tech companies. Some of those practices are:

—- **Minimize workstation standards:** The number of different workstation standards is minimized so that workstations are not differentiated. For example, the 2 million-sq.-ft. (185,800-sq.-m.), 6,000-employee Pacific Bell San Ramon Valley Administrative Center is based on only five personal workstation standards.

—- **Move people, not furniture:** People are moved, but workstations are moved far less frequently.

—- **Make all space generic:** The basic space is as generic as possible. In other words, there is little or no distinction between office, R&D, manufacturing, test and warehouse space. This goal is easier to obtain for companies which do not require specialized facilities (e.g., special floor loads, air conditioning, clean-room environments, ceiling heights and vibration requirements).

The management of facilities which are designed along these practices is greatly enhanced with the use of computer facility planning systems.

Conclusions

Strategic facility planning for high-tech companies requires different approaches in terms of methodology, procedure, design and tools because of the difficulty of predicting business plans and the necessity for quick, ad-hoc management decisions. These include: top-down facility demand analysis, the use of demand scenarios, risk evaluation of facility strategies, design/planning/management approaches and computer modeling techniques.

SUGGESTED READING

1 Day, L. Linn. "Facilities' Role in Strategic Planning," *Industrial Development,* March/April 1988, vol. 157, pp. 12- 16.

2 Pittman, Robert H. "Integration of Real Estate into Corporate Strategy: a Progress Report," *Industrial Development,* January/February 1989, vol. 158, pp. 2-3.

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1 Strategic facilities planning

2 Facilities planning