INFORMATION SYSTEMS FOR LAND ACQUISITIONS:
WISH LISTS, CURRENT PRACTICES AND POSSIBLE SCENARIOS

by

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Submitted to
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ABSTRACT

As the regulatory environment becomes more restrictive and complex, the lead time needed for obtaining approvals in land development, lengthens. This, in turn, increases risks due to the difficulty of forecasting future supply and demand. New sources of information could reduce uncertainties in site selection.

Land developers were interviewed to determine their information wish lists. Descriptive accounts of the acquisition process indicate that these decisions are individually defined combinations of information-gathering and experiential judgement. A technical approach is suggested that would enhance this type of decision making.

Descriptions of three evolving information systems are presented as examples of current practice, and illustrate the difficulties of implementation. Then, possible future scenarios are supposed of information systems being used for land acquisition. Finally, a recommendation is made to proactively position development companies to benefit from advances in microcomputer technology and the movement to create public land information systems.

Thesis Supervisor: Gloria Schuck
Title: Lecturer, Sloan School of Management
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In keeping with the philosophy of learning that founded the Center for Real Estate Development, this thesis combines the vision of academics with the insight of practitioners. It is not the sort of research that offers quick solutions or generates obvious cash flow. It is an inquiry for which we have yet to learn the language, let alone understand the implications. The imprecision of the task makes it all the more remarkable, that so many were so willing to take time to reflect. I feel very privileged.

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TABLE OF CONTENTS

Abstract .................................................................2

ACKNOWLEDGEMENTS..................................................3

TABLE OF CONTENTS..................................................5

INTRODUCTION.............................................................6

CHAPTER ONE - INFORMATION NEEDS OF LAND DEVELOPERS........17

CHAPTER TWO - SUPPORTING DECISIONS WITH TECHNOLOGY.........40

CHAPTER THREE - MINI CASES.........................................48

CHAPTER FOUR - A FUTURE FOR DSS IN LAND ACQUISITION?.........70

APPENDIX A - SAMPLE OUTPUT/CASE ONE.............................86

SELECTED REFERENCES................................................87
INTRODUCTION

Billions of dollars worth of land is bought and sold without either party having anywhere near enough market facts to support his price judgment. Both buyer and seller must grope to decisions by hunch and by guess, for America's biggest industry must get along with more inept and inadequate statistics than any other industry. The federal government spends more money for market research on peanuts than for market research on land....Nobody keeps a running inventory on unsold lots....So scarcity is exaggerated and prices are inflated by professional optomists spreading inside dope that cannot be checked.

[House and Home 1960]

Twenty-seven years later, land development continues to be thought of as a complicated web of uncertainties in the riskiest portion of the real estate business. Typically, the rewards have been high to compensate for those uncertainties. This has encouraged an ample supply of ever-optomistic entrepreneurs who rely on their ingenuity and knowledge of the market to make heuristic decisions about land acquisitions, especially when lenders have been willing to loan 80-100% of appraised value.

In the past, demographic growth and inflationary real estate values bailed out many land developers (and their lenders) who had significantly underestimated the cost volatility of planning, processing and approval of their parcels. Also, if repositioning in the market was required to correct for
planning misjudgments, the typical firm was small and flexible enough to adapt to a changing economic environment. Even some of the large, national companies who had the strategy of expanding marketing budgets to accelerate absorption were careful to maintain enough autonomy in their regional offices to preserve a sense of entrepreneurial resourcefulness when a project got into trouble.

Land developers, then, have learned to live with uncertainty as a way of doing business. They traditionally have relied on an inflationary economy, in-house inventiveness, conservative projections, high profit margins and "back doors" to mitigate the downside risks. If all else failed, the keys and the problems belonged to the lenders.

There is evidence that a transition is taking place. External conditions are pushing developers to search for more data and become more methodical about analysis. This chapter will examine some of the driving factors in this change.

**RISK MANAGEMENT**

Today, land developers depend not only on contingency plans but also on their abilities to manage consequential risks from the start. Using more detailed pro formas and sensitivity analyses to identify major sources of risk in a project, developers hope that special attention and early
detection will reduce any potential, negative impacts. The risk management tasks, unfortunately, are multiplying as land development increases in complexity and requires more up front time.

REGULATION WITHOUT INFORMATION
Communities, through the zoning approval and permitting process, have increasingly modified the rights of private real estate owners. This has been particularly true in the areas of environmental control and public facilities planning. Permits are in the realm of public documents and thus open for comment and criticism from lay people as well as agency officials. Often, outcomes are based more on the personalities of the players involved than on some unified community policy.

These modifications to land tenure are seldom explicitly attached to individual titles or assimilated into a parcel-oriented, land information system. As a consequence of the individually negotiated nature of the regulatory process, inconsistencies and duplication of effort are common. This makes it difficult to estimate the eventual cost, measured in time and money, of required studies, impact fees, proffers or possible lawsuits when the land is being valued for purchase. The time required for obtaining regulatory approvals has become one of the key uncertainties
EXTENDED TIME DELAYS
Lengthened processing time aggravates risk in another way. Many land developers are finding it almost as time consuming to process a small project as a large one. To make better use of key staff members, the size of projects undertaken has often expanded at the expense of locational diversification. This may be more organizationally efficient but can add to the overall risk of the venture by concentrating a greater percentage of company resources in one project.

INCREASED MARKET UNCERTAINTY
Extensions of the regulatory approval timeline increase market risks by subjecting the project to changing conditions. The further out in time that supply and demand has to be forecast, the less reliable the projections. Uncertainty is aggravated further if the jurisdiction does not maintain reliable and current data on which to base employment or demographic projections.

As a further complication, many economists believe that the national real estate market is undergoing structural changes due to shifts in demographics, employment bases and other factors. Relying on past parochial experience to forecast future need could be risky.
LAND VALUES

At the same time, land prices in many inelastic, regional markets have inflated significantly due to vigorous competition. Contingent purchase and sale agreements and extended due diligence periods come at considerable expense in these regions. Developers perceive scarcity and believe that they have to move quickly to gain control of desirable parcels. This frequently occurs before important factors have been adequately analyzed, adding to specific site uncertainty.

In these localities, speculation may be forcing the market into supply and demand disequalibrium with land prices unduly high given the approval risks. In the long term the market will self correct, but the interim lag may cause costly misjudgments.

INSTITUTIONAL PARTICIPATION

In the capital markets, thrifts and other institutional lenders are trading lower interest rates for participation in future upside potential. Rarely does the institutional investor take on any of the approval risks, preferring instead to activate the partnership at a more secure phase of the project. Even when the partnership agreement compensates
the developer for the market value of the land after approvals, that value may be divided or even confiscated if performance does not measure up to pro forma projections.

Lower interest rates do reduce cash flow needs during early operational stages, often critical in high vacancy periods. By sharing the long-term profits of successful projects, however, the developer may not be able to build enough reserve to consistently cover the development risks of new ventures.

SOURCES OF FUNDS
The tax code revisions of the 1980s have decreased the use of syndications as a vehicle for project funding. More recent entrants into the real estate capital markets, such as foreign and pension fund investors, are generally not interested in unbuilt projects. Since there are fewer lenders willing to fund land development, the cost of land development loans remains high as the risks increase.

SHRINKING PROFIT MARGINS
As a result of these interrelated uncertainties, in competitive and highly regulated markets, the profit margins for land development are likely to shrink. Accessing reliable information and knowing how to use it are necessary
prerequisites in finding niches and predicting trends that will help maintain competitive advantage.

SUMMARY
Despite a usual willingness to live with risk, land developers in competitive and regulatorily mature regions are disconcerted over increases in market and political uncertainties. A simplified explanation for this uneasiness is that more factors that affect success seem to be out of a developer's control and difficult to evaluate.

The market and the political/legal climate, are people-oriented variables. These factors are dependent on people's preferences and attitudes in the context of economic and regulatory conditions which are complicated interrelationships to predict. The developer must forecast:

What would intended occupants be willing to pay, several years in the future?

What will the developer be expected to pay to those affected by the proposed project before approvals can be obtained?

Additionally, real estate economists and capital market experts are observing structural changes in the industry.
Although there is no unified vision from economists about the effects, macro supply and demand factors such as the overbuilding of the office market, the aging of the "baby boomers," and the growth reduction of the GNP, are expected to alter patterns that have been operating during the last two decades.

If use, market, and timing are not properly matched under these conditions, profit margins in real estate may shrink significantly, reducing effective yields and causing many investors to place their capital elsewhere.

ISSUES RAISED
Successful developers often are characterized as having some "sixth sense" that enables them to divine a suitable location for a project. Cultivating this mystique prevents systematic understanding of the decision criteria used in land acquisition. If the criteria were more explicit developer information needs could be better assessed.

What drives an acquisition - Internal company goals? External market conditions? The willingness of a lender to provide funds? Predisposition of the developer? Happenstance?

What sources of information are being used by land
developers to make acquisition decisions? Where are the information gaps? What data is needed and in what form would it be most useful?

Is technical support available to systemize this data and better inform a decision maker? What type of technology is most suitable for land developers? How can appropriate technology be integrated into land development companies?

OBJECTIVES AND ORGANIZATION OF THIS THESIS

By analyzing the criteria used by developers to select sites, some key uncertainties, caused by information gaps, are identified. The objective is to explore ways in which components of information systems could be used to extend the range and depth of land acquisition analyses to better manage risk and reduce uncertainties.

CHAPTER ONE summarizes findings from interviews with twelve commercial and residential developers who make major land acquisition decisions in competitive markets. These findings were supplemented by interviews with other people associated with land development, such as lenders, site designers, and planning officials. Particular attention is focused on key decision points and information sources currently used to supplement intuition and local market experience. As a
result of these interviews, a "wish list" of information that would help developers reduce uncertainty has been constructed.

CHAPTER TWO suggests a working definition of Decision Support Systems (DSS) that emphasizes extending the range and depth of analysis to improve effectiveness. This discussion sets a perspective for considering the technological tools appropriate for land developers.

CHAPTER THREE contains three, development-oriented mini cases of companies that have introduced components of DSS. Each example is analyzed using an "automate/informate" framework defined at the beginning of the chapter. The first case illustrates how a practitioner uses interconnected models to test the financial impacts of alternative site-specific designs. The second case is about a company that models U.S. markets econometrically to strategically plan acquisitions by location and use. The third case is a retrospective look at a real estate company's decision to automate and centrally integrate a database to increase operational efficiency and strengthen its strategic planning process.

CHAPTER FOUR builds on the developers' wish lists. It identifies data sources and existing or emerging technology that could address future information needs. Scenarios of
interactive applications relevant to land development are proposed. Finally, a proactive organizational and jurisdictional approach is recommended.
CHAPTER ONE

INFORMATION NEEDS OF LAND DEVELOPERS

The development of an integrated, large parcel of real estate today calls for techniques as dissimilar from the past as those required to pilot a jet compared to flying an ancient Jenny. We are no longer flying by the seat of our pants. Rather we proceed on instruments perfected by master technicians.

[Gerald W. Blakeley 1960
While planning Laguna Niguel, CA,]

Blakeley was referring to three, then relatively new, techniques:

1) market analyses using economic data—jointly developed by the county and a research department of a university, then analyzed by market consultants;

2) master site planning of the land to match the future community to the natural features; and

3) public backing to help finance land purchases and improvements.

In other words, public and institutional sources of data were combined with expert knowledge to determine market and site feasibility. This in turn was supported by the commitment of public financing. Information and resources were jointly contributed by the developer and the surrounding community to plan this new town.
Developers interviewed for this research observed that, in active markets today, this type of cooperation rarely exists. Instead, an adversarial relationship between the community and the developer, not conducive to joint planning, is common. The regional market data that can be accessed was often characterized as "not current, not in a useable format, or too time-consuming to track down."

The public information used in making land acquisition decisions is usually site-specific, augmented by topographical and public facilities data and combine with on-site assessments by professionals from the private sector. Information sources used for other critical factors vary according to the decision making process of the developer.

WHO, WHAT, WHERE & HOW

Twelve commercial and residential developers, from regionally or nationally, recognized companies, were interviewed to obtain descriptive accounts of their land acquisition decision processes. Particular attention was paid to the information sources they used. The firms surveyed for this chapter were active in either metropolitan Boston or Washington D.C., two of the most competitive real estate markets in the country. (Some of the firms also operate in other regions.) A number of other professionals associated with land development supplemented the research with their
It is worth noting that, according to principals in these firms, information gathering for land acquisitions is rarely totally delegated. Components, such as generating pro formas or obtaining plats, may be delegated to specifically trained individuals at lower levels. However, detailed evaluation by senior-level, regional staff is considered essential despite the fact that their time is expensive. It makes sense that those with the most experience are expected to have the best "feel" for the land and location. What is less apparent is that they also contribute significant input from a personally proprietary networks of sources.

The findings from the interviews have been clustered into categories of factors considered important by these developers. Wherever possible, explanations have been offered for variations in responses. In most cases, the professional background and style of the decision maker seemed to influence both the approach and sequencing of the acquisition process. Despite differences, common concerns and information needs emerged. Particular attention was given to determining the information, whether accessible or not, deemed pivotal by the developers.
LOCATION, LOCATION, LOCATION

"Real estate types" are fond of quipping that the three most important criteria in selecting a piece of property are "location, location, location." What location really means is the degree of market acceptance of a specific site.

Locational preferences differ depending on intended use. Externalities, such as modifications in a transportation system or prohibitively high land prices in an adjoining area, alter preferences over time. Often these changes occur in a few years—the time it takes to plan and construct a large project. Understanding, locational preferences of the market and anticipating market acceptance upon project completion are two critical aspects of decision making.

IDENTIFYING POTENTIAL SITES TO BE CONSIDERED

Even companies in multiple markets respect regional differences by giving local development staff significant autonomy in ferreting out potential acquisitions. Developers get leads from associates in their real estate network, from land owners who know them by reputation or from studying maps and statistics that provide information about future trends.

Companies who have been in a particular regional market for a number of years, with the same senior people making land
acquisition decisions, were more likely to rely on reputation and network to identify sites. In other words, people generally come to them with deals to consider and they react. If there is a particular type of project that the company is looking to undertake, they use the network to make it known.

Those companies with new branch offices or personnel changes in key positions were more likely to use an informal method of prospecting developable land. "Windshield surveys" with bits of information from economic development offices or leads from newspaper reports, or unattributable hunches, are common practice. Alternatively, brokers or bankers might know and suggest a property worth considering.

A sizable range of approaches also exists in the way firms plan the timing of future acquisitions. Some react to workload with little attention to local, real estate cycles. As existing projects require less staff time, new parcels are actively sought using the methods and criteria particular to that firm. One regional developer expressed the wish that the corporate planners would pay attention to real estate cycles so that more favorable terms could be negotiated at the time of site purchase.

Another development company annually acquires a certain, predetermined amount of land and treats it as inventory. The
time horizon for development varies from one to fifteen years. This CEO said that it is difficult to have much confidence in value projections beyond a one or two year horizon yet the lead time needed on projects continues to grow as a result of complicated regulatory and political environments. He and others shared concern over the increased level of uncertainty caused by the lengthened approval processes.

Although there was no exclusive approach to seeking sites, the need to make selection criteria explicit beforehand was frequently mentioned. Consideration of projects incompatible with organizational resources can waste the time of experienced staff members.

THE QUICK CHECK
Adequate infrastructure and transportation access are predictably regarded as essential. They are the first criteria evaluated because without these, the project will go nowhere. In most cases, it was agreed that this information is readily obtained from governmental agencies or consulting experts.

Consensus on this first step, however, did not foreshadow agreement on the entire site evaluation process. One company extensively researched and modeled a market before seeking
any sites. Another bought more than a thousand acres of Florida marshland as a first development venture because its baseball team wintered nearby. For some, the return on investment hurdle-rate had to be met. For others, an appealing location gauged by intuitive standards, meant that project performance requirements could be relaxed. Even the most ardent "numbers enthusiasts" spoke of a parcel needing the "right feel" coupled with a favorable pro forma.

Nevertheless, five identifiable categories of information considerations emerged from the interviews:

1) market acceptance at completion,
2) political/legal environment,
3) physical site constraints,
4) financial performance projections and
5) corporate strategy.

Findings from the interviews are separated into these categories in the following section. The developers' wish lists are woven throughout.

1. MARKET ANALYSIS

Many of the developers interviewed believed that their knowledge of their markets was superior to analyses produced by outside consultants. They complained that professional market researchers spend too much time looking at numbers and extrapolating from questionable data sources, and not enough
time in the field, talking to informed sources.

Most of the companies did, however, contract for market reports, some more than others. The reasons cited were: 1) lender requirements, 2) the potential opportunity of going into an unfamiliar market, 3) not enough available staff time for feasibility assessments and 4) verification of heuristic judgments already made about market depth. Some developers do use trusted market research companies routinely and find the reports important in determining feasibility as well as for project pricing and design.

The assumptions on absorption used in pro formas, however, usually come from either company experience with similar projects in the market area or through the network of sources and contacts rigorously, but informally, maintained by senior level developers. These assumptions are typically verified by "leg work" in the area that is competitive to the site.

Not surprisingly, most developers interviewed saw market acceptance as the projection with the greatest uncertainty. Imperfect general knowledge of the market traditionally has kept real estate development entrepreneurial and decentralized. This breeds opportunity for those who are able to parlay experience into good marketplace judgment.
In competitive markets it was observed that more variables require consideration and there is less time to make decisions. Reliable and accessible information about local supply and demand, according to those interviewed, is becoming even more critical to project planning. Some point out that with more transactions taking place it is difficult to track complex and changing trends without hard data.

Economic Development Offices were credited with assembling useful growth projections and acting as an information exchange between developers and potential users. The departments were characterized by one developer as "cheerleaders for in-migration and business growth." Public planning departments were seldom seen as supportive of developer interests.

A macro economic understanding of current American real estate markets was considered important by only a few of the developers interviewed. For those committed to a particular market, a hiatus of activities during economic downturns was not thought to be a viable option. There appeared to be an optimistic attitude that a local or regional opportunity niche could always be found. It was also mentioned that both national and local economists frequently had contradictory real estate forecasts. Almost everyone shared a story of a project that had been successful despite expert warnings to
the contrary.

**MARKET ANALYSIS WISH LIST**

1) Frequently, developers wished for more accurate local supply data (i.e. what is being planned), demand data (i.e. employment growth and household formation) and the means to forecast market dynamics further into the future. Some jurisdictions (such as Fairfax, Virginia) were seen as more helpful than others in providing information useful for development planning.

2) Developers also wished for more consistent recordkeeping across proximate jurisdictions. They expressed the view that that inconsistency creates difficulty in tracing local growth patterns to select optimal locations for new projects.

3) Some of those interviewed mentioned the need to systemize piecemeal-data on business growth or migration. Economic development data keyed to a mapping system would be of great benefit.

4) One developer talked of a "timing method" for determining points which land prices would drive project costs above the user's willingness to pay threshold. If this could be anticipated, acquisitions might be sought in
less convenient, but more affordable, areas.

5) Another developer envisioned a local sales database that accurately disaggregates the selling price of the land from improvements. It would also take into account any special conditions of the property or factors reflected in the buyer/seller agreement.

6) Although few believed it would be possible, many wished for a systematic way of storing and retrieving data gathered through informal networks. Some pointed to piles of notes, bulging roladexes and unfiled newspaper clippings as sources of important information. As mentioned before, this compendium of data is typically filed in a dealmaker's head, yet is central to the acquisition decision process. The biggest obstacle to a more systematic approach of storing and retrieving "soft" information is seen to be people. Doubts were raised about relying on a developer's inclination to make routine inputs into an information system given erratic job pressures.

2. POLITICAL/LEGAL UNCERTAINTY
Developers, known for their penchant to see glasses half full, generally have tolerated a certain amount of political uncertainty in the approvals process. Some have observed that it acts as a barrier to entry and helps alleviate
overbuilding. This keeps profits higher for those who are willing to deal with the unknowns of working with local communities. Houston thus has become the frequently cited example of the dangers of too little zoning restriction.

Many of those interviewed, however, are concerned that political uncertainty in competitive real estate markets is becoming too great. According to some, this increased uncertainty is due, primarily, to extensions of the intangible rights of the public. Specifically, they point to the public sector's ability to modify or claim a portion of private property tenure for "public good." Put another way, the use of consistent impact fees for off-site improvements can be programmed into the valuation of the parcel when considering a purchase. On the other hand, unauthorized costs such as "voluntarily" required proffers, unexpected lawsuits, moratoria or other informally required concessions can only be predicted using the current political context for a project that might take years to process. Changing administrations and public sentiments give added dimension to this uncertainty.

Those interviewed direct development activities for companies that have been in a specific region for many years. They feel pride in creating part of a community and concern about the adversarial positioning that they believe has become part
of the approval process.

Repeatedly, "reputation" and "living up to your word" were cited as critical to finding and processing land for development. Many of the most promising sites were acquired through the network of business contacts based on reputation. All see themselves as responsible business people with both a personal and professional stake in helping to maintain a good quality of life for the community. Some indicate that they feel singled out to carry more than their share of the burden of economic and demographic growth.

**POLITICAL/LEGAL WISH LIST**

1) Reducing processing time for approvals, making publicly levied fees explicit and eliminating capriciousness in community negotiations were the most frequently expressed concerns. A site could be valued more accurately, if politically sensitive costs were more determinable at the time of acquisition. Implicit in this viewpoint is the expectation that the selling landowner would absorb some costs by accepting a lower price as a result of the negative externality.

2) Some hoped for greater cooperation among communities, municipal planners and developers in evaluating proposed projects. Two developers suggested the creation of generic
guidelines for citizen input "to prevent endless meetings with irrelevant agendas." One other developer also pointed out that developers and community groups often pay consultants to "duel it out with their computer models" when all might be better served by collaborating to assess impacts.

3) Careful timing is considered of primary importance in approvals negotiation. One developer wished for a convenient way to keep track of all proposals up for public hearing. With such a reference, a project would be less likely to get entangled in other issues due to unfortuitous timing. An example involved a hearing on a proposed traffic interchange that was scheduled in the same month as the zoning hearings on a proposed office project. The community linked the transportation issue with the office project. (The developer believed that an unfavorable outcome was in large part due to the prominate timing of the two hearings.)

4) A related suggestion included a publication that would provide summaries of public hearing outcomes including itemized dollar amounts for impact fees or concessions. It was thought that this would be helpful in negotiations with community groups and government officials by encouraging consistency and prevent duplicate payments for the same improvements.
A follow-up was suggested that would track the proceeds from impact fees or concessions and determine where funds were actually used. The developer interviewed suspected that much of the money collected in that county was spent for improvements that would never benefit the users of the project.

3. SITE FEASIBILITY
As previously mentioned, transportation access and adequate infrastructure are first on the critical factors checklist. Most of the time, developers feel that the information necessary for determining preliminary feasibility is accessible. Public information sources are supplemented by various specialists in soils, land-use planning, environment, engineering, architecture, title and others. These specialists, in turn, supplement their knowledge with technical tools to increase accuracy and the speed of gathering data.

The costs of physical site preparation are generally thought to be predictable and ascertainable during a sixty day due diligence period prior to actual transfer. For some who acquire property, though, even this is painfully long.

The purchase price is almost always negotiated before any...
study period begins. If something is discovered that makes the project unfeasible, then the deposit is typically returned and the cost is in time lost. There is an array of site or title limitations, however, that must be discovered during a formal search. These constraints may not warrant project rejection, but are potentially important in determining land value. This information is seldom available when purchase price negotiation is underway.

SITE FEASIBILITY WISH LIST
Developers rely on a number of environmental and engineering consultants to determine the cost of site work. According to those interviewed, relying on outside expertise does not significantly increase uncertainty because there is a great deal of confidence in the estimates generated by these specialists

1) There is one exception -- hazardous waste. A few wished for more complete and accessible information on the cost of cleaning up various types of hazardous waste to more accurately value a contaminated parcel. If clean-up costs were better known, an informed developer might find opportunity in taking on a hazardous waste risk that others feared.

2) One land assembler wished for title reports that
could be obtained within hours instead of weeks. As pointed out in the last section, knowing all the details of the title when negotiating a purchase and sale agreement, particularly in land assembly, could make a difference in the price paid.

4. FINANCIAL FEASIBILITY
The accuracy of financial analyses is dependent on the accuracy of the assumptions generated by other criteria. Developers surveyed said that preliminary project numbers are generally "back of the envelope" followed with pro formas, generally created on electronic spreadsheets.

In many cases, the decision makers themselves generate the pro formas while others rely on staff members with financial training to conduct the analysis. A customized template often standardizes the format for comparison between projects.

In order to determine the assumptions that will have the greatest impacts on project performance, most of those surveyed use a series of sensitivity analyses. Optimistic, pessimistic and most likely case scenarios are typically forecast. Correlated risks are extrapolated informally.

Two developers separately acknowledged that the impetus for
adopting computer-based financial analysis was the desire to deal more effectively with the "MBA types" who approve loans. Obtaining lender commitment during the "due diligence" period reduces the level of risk in a key uncertainty -- the terms and rate of the financing. It is interesting to note that almost none of the developers mentioned concern over the long term outlook for interest rates while a few years ago, this was the variable that was receiving the most attention.

Talking the language of the lender through pro formas that include sensitivity tables, expedites the loan approval process. As a secondary bonus, these same developers find that the approach increases their understanding of project uncertainties. Paying special attention to the variables with the greatest potential impact on bottom line profits allows a development staff to better manage risks.

FINANCIAL FEASIBILITY WISH LIST

1) On large projects that will be phased in over time, uncertainty is reduced if a developer can lock in an interest rate (or interest rate range) for a number of years.

2) To save staff time and encourage lenders to be more competitive, a developer suggested a "Shop-for-Terms From Your Office" program on a cable network. Lenders with
available funds would advertise the type and range of current terms.

3) In large companies where computers are often closeted with the "whiz kids", there is a desire among senior staff members to analyze pro forma variables themselves. Experimenting privately could suggest alternatives that had not been considered when working through an intermediary.

5. STRATEGIC PLANNING TO SET ACQUISITION CRITERIA

All of the developers interviewed operate under some type of corporate guidelines for property selection. In some firms, guidelines are informal, such as knowing budget limitations, the project types existing staff is best equipped to handle, or the minimum rates of return that the company can accept for differing levels of risk. In other cases, the guidelines are more explicit. Some developers only operate in certain markets. Others only will purchase land already appropriately zoned. Almost all admit, however, to a willingness to discard any set of rules if a significant opportunity comes along.

Guidelines become site-specific criteria for those development companies who use corporate planning theory and/or portfolio diversification models to preset parameters for location, size and use. In other words, company
restrictions on resource allocations and the model used for diversification determine the specifications of a potential site. Once the parameters are determined, the appropriate network in a selected national market is made aware of the exact type of property that the company wants to acquire. Potential parcels are then brought to the attention of the regional developer who makes decisions on acquisitions based on experiential knowledge of that specific market.

Developers who use corporate planning as a prime determinant in land acquisition believe that it hedges risks by reducing the overall variability of company returns and it makes more efficient use of key staff time. Development companies with favorable local reputations, are often brought numerous, unsolicited potential deals to consider. Having corporate parameters, then, expedites internal decision making.

STRATEGIC PLANNING WISH LIST
Staff developers and CEOs agreed that their strategic plans have generally been inadequate. In some cases company objectives consist of vague profit-maximizing language coupled with corporate tendency to undertake particular product types. In other cases, the planning is more detailed and regular, but originates at top management levels and thus is not easily modified. Still other developers were slightly embarrassed to admit that they operate from project to
project with no real long-term strategy. The information wish in most cases relates to increasing confidence in market forecasts to determine how to position the company in the coming years.

There are notable exceptions. One company operates with a five year horizon guided by corporate planning and portfolio diversification models to establish general strategy. Acquisition criteria is developed jointly between the regional and national managers. Another company, one of Chapter Three's mini cases, uses econometric models to determine both the location and type of acquisition sought. (This strategy is exampled in mini case two in Chapter Three.)

SUMMARY OF FINDINGS FROM INTERVIEWS
Site evaluation has two stages for land developers. The initial decision to acquire a parcel is probably based on inexplicit criteria and quick calculations. The internalized checklist is difficult to identify let alone quantify. Staff members who have spent sufficient time with successful land developers report that they take note of flying sea gulls, "might mean a dump nearby;" undulating pavements, "could be seismic activity;" new branch banks "possible signal that demographics and earnings are growing." These and numerous other pieces of information somehow feed into the decision,
"I want this parcel." One observer wished for a way to access and give relative weights to the mental checklist of his manager. "I don't even know how many criteria are on it. Could be 200 or 1000."

By sequentially taking on the roles of the other players necessary to make a project work, the developer reaffirms the initial decision.

Does it have the return projections and margin of safety that the lender would need to fund it?

Is it in line with community planning objectives and what concessions would be expected if it deviates?

What arguments will abutters have and are the prevailing political winds in their favor?

Where will the contractor find site premium costs?

Is there an environmental issue to consider?

Does the project fit corporate guidelines?

The persona of the intended user is often the most elusive.

How will the market accept the product several years out?

What will be competing against it at completion?

This second part of the decision process is principally concerned with valuing the land and determining if there is anything that will absolutely block the project. The anecdotal evidence seems to indicate that a tentative decision
to purchase is made early in the first stage based on a combination of intuitive, experiential and possibly visceral criteria. The decision maker double checks this preliminary choice by using the persona exercise. It is in the second part of the decision process that developers feel the need for more information. Specifically they need to better understand the political/legal uncertainties as well as the prognosis for eventual market acceptance. Some are hiring more staff or contracting for more studies. Others are considering less competitive markets. A few have looked at the microcomputer ensconced in their office and wondered what more it might do?
CHAPTER TWO
SUPPORTING DECISIONS WITH TECHNOLOGY

Data are the very latest kind of pollution. Information is what changes us. [Stafford Beer 1975]

There is no one definition for Decision Support Systems (DSS). Differentiation within the field of information technology is evolving as theory is tested in the workplace. By trying to define an existing entity, jargon often blurs real understanding. Nevertheless, in assessing how DSS could be used as a decision tool in land acquisitions, we need a working set of parameters drawn from current literatures.

DSS DEFINED

Keen and Hackathorn believe that "Decision Support Systems are interactive computer aids designed to assist managers in complex tasks requiring human judgment. The aim of such a system is to support and possibly improve a decision process." [1979, 3] They go on to say:

Decision Support begins from observing a decision process and defining what improvement means for specific individuals or groups within a specific context...[It] is more than just a simplistic packaging of information systems and models. The software interface, which is the feature distinguishing a DSS from other interactive packages, ..., becomes the main focus of attention for the designer. Building a DSS requires, above
all, skills in designing humanized interfaces and a secondary ability to exploit any self-contained technique or product developed within the MIS or OR/MS fields. [Keen and Hackathorn 1979, 3]

OBJECTIVE: INCREASE THE EFFECTIVENESS OF DECISION MAKING

According to Alter, "The emphasis of DSSs is on increased individual and organizational effectiveness (in decision making) rather than on increased efficiency in processing masses of data." (1975, 3) Automation of certain operational tasks may be a component of the system. The time and effort saved, however, would ideally be used to do a more thorough job of analyzing the substantive aspects of a decision.

Keen and Scott Morton define effectiveness as "identifying what should be done and ensuring that the chosen criterion is the relevant one." [1978, 7] In other words, technically improving an organizational process that is not critical to overall performance does little to improve effectiveness. The point of DSS is to identify key decision points and focus technical tools, as well as human discretion, judgment and creativity, on the decisive components.

At times, a seeming conflict between efficiency and effectiveness is perceived because "effectiveness requires adaptation and learning, at the risk of redundancy and false starts."[Keen and Scott Morton 1978, 7] The hope is that more effective decision making in the present will lead to
improvement in future performance.

INTERACTIVE AND FLEXIBLE

In theory, DSS is never superimposed into the decision making process but rather evolves from one application to another. DSS is continually customized and evaluated to more closely match the needs and habits of its users. If the user changes, the system will not necessarily perform in the same way. Put another way, user expectations and assumptions change criterion and utility.

Further, DSS is the most effective when it is decentralized and in the control of the decision makers. According to the studies performed by Danziger and Kraemer [1986], a user is more inclined to test different scenarios for solving a problem or making a decision, perhaps unconventionally, if it can be done in the privacy of a user-friendly environment rather than through a technical expert.

A command-driven system, with 'help' routines, plausible checks, choice of 'expert' or 'novice' modes and high-quality display devices reduces the fixed cost of learning...and also reduces the semifixed, set-up costs incurred at the start of each run (structuring the problem, remembering commands, etc.). [Keene 1979, 12]

MARGINAL ECONOMICS OF EFFORT

Perceived benefits must outweigh the effort (cost, measured in terms of time and money) required for a DSS to be used and
useful. This is what Keen refers to as "marginal economics of effort" [1979, 17] Benefits, however, are not as readily measured as costs. In contrast to the quantitative costs (particularly in an "organizational setting where situational factors cannot be controlled for" [23]) qualitative benefits are harder to define and capture. Unlike saving time or money by automating structured tasks, improved effectiveness is difficult to evaluate without well-formulated measurements for tracking.

Among proponents of DSS, it is an article of faith that interactive aids to problem-solving improve the effectiveness of managerial decision making. They point to examples of DSS that have led their users to explore more alternative solutions, examine data in more depth and detail and become more analytical in their approach to problems...[However], a tool that encourages an incompetent individual to expand the range of solutions he or she inadequately assesses seems unlikely to improve anything. [1]

The design and evaluation of a DSS, then, cannot be divorced from its user. A thorough understanding of the decision making process and competencies of the individual within the specific organization is important to improving performance.

The potential user must weigh the perceived value against the relative costs of effort. The most apparent costs will be the fixed ones of adjusting to and learning the system...The incremental costs of effort implicit in a DSS can generally be reduced by skillful design....which invariably means incurring [costs in] software overhead. For example, a "Help" command...in no way adds to the problem-solving facilities of the system and requires a large amount of program code which takes time to write and may waste storage...However, it makes the system easier to learn. [18-19]

At each step, the marginal economics of effort should be
carefully evaluated before adding a new application.

Keen suggests generic operations that DSS can potentially address:

1) **Computation** costs in effort should always be reduced by the DSS, provided the computation can be requested quickly and easily in a minimum amount of steps.

2) **Search** costs can be reduced by the provision of commands that reduce set up and perform a range of operations quickly. The extreme is *simulate* which calculates the impact of a specific set of decisions and parameters. If users can also change values easily, they will find that searching widely for and fine-tuning alternatives imposes almost no cost.

3) **Inference** effort can be dramatically reduced, but only if the user trusts the answer. The user need not understand the inferential methodology but must trust it. For example, comparatively few users of standard statistical packages really understand the details of the method, let alone how they are translated into a computer routine; they accept it because they have consensual trust.

4) **Assimilation** costs may be increased by using Decision Support Systems because the output may require too much intellectual effort to grasp or may be in an inappropriate format for the user's needs. For example, graphics substantially eases the effort required for assimilation, but at the potential risk of loss of conscious attention to data. More systematic study is needed about output choices and effects.

5) **Explanation** costs are greatly eased if the software systems and output formats are well-designed and communicative. One implication is that a DSS can be effective as a device for organizational and joint problem-solving. If the marginal costs of examining another alternative is close to zero, there is every incentive to listen to someone's line of reasoning. [19-22]

To summarize, Decision Support Systems typically evolve piecemeal in an organization beginning with existing
technologies and predispositions for problem-solving. In a well-designed system, a competent user can quickly, and relatively painlessly, massage data into information that may not have been accessible or comprehensible before. Ideally, this additional information will increase the level of confidence in a specific decision.

**DSSs AND LAND DEVELOPERS**

The interactive and adaptable nature of DSS is particularly appropriate for land developers. These developers undertake a diverse range of projects that are significantly affected by changing economic and political environments. This macro and micro variability requires frequent market repositioning and the ability to make quick judgments when unforeseen circumstances or opportunities materialize either on or off site.

As mentioned in Chapter One, land developers historically have relied on experiential judgments and quick calculations to make the "go/no go" acquisition decisions. Computer technology has been an indirect tool used typically through an intermediary, such as the local municipal government, to provide site specific information or through consultants to generate market forecasts.

In-house microcomputers, however, are no longer rare in the
offices of land developers. Sometimes they are used solely as an extension of a calculator to store and retrieve costs. In other cases, pro formas -- from simple to complex -- are vehicles to arrange financing or more fully understand the range and relative impacts of specified risks through sensitivity analyses. Also, the development of PC and DSS technology has some common aims that are appropriate to individualistic developers. The technology is, for instance, easy to use, readily accessible and able to increase the efficiency and effectiveness of the user who is not a computer expert.

A few large developers have mini or mainframe computers in operation. These systems drive a Management Information System or a DataBase Manager to automate accounting, manage assets or other operational functions. In the future, this software or hardware and data can become a resource for an evolving DSS within a company.

In fact, new applications for computer technology are already being tested as supportive tools for land development decisions. Lenders, planning officials and market researchers, as well as developers, are experimenting with ways to systemize components of the decision process so that critical information can be more reliable and accessible.
Chapter Three presents applications by practitioners who have formulated components of a DSS. Case One relates to site feasibility modeling. The company in Case Two takes a macro view of markets and studies them econometrically. Case Three summarizes the experience of the staff of a national developer as it undertook the implementation of a company-wide information system. Although the development of a DSS is a dynamic process, the next chapter can only describe current iterations in three DSS evolutions.
INTRODUCTION TO CASES

DSS is not an identifiable entity but rather a collection of technologies and strategies that evolve in a company over time. The perceived needs, goals and expertise of the decision makers will influence the characteristics of the systems that evolve.

Zuboff differentiates between automating an organizational process and "informating it."

The choice of emphasis is above all a question of strategy and derives from management's conception of the contribution that this technology can make to the business. Informating may proceed as an unintended and undermanaged consequence of computer-based automation, but it can also be part of a conscious management policy designed to exploit the new information presence to create a different and potentially more penetrating, comprehensive, and insightful grasp of the business...thus strengthening the competitive position of the firm. [1985, 9]

Schuck extends the discussion to suggest a shift from emphasizing smart machines to encouraging smart people. "In an informed environment, the issue is no longer how much you do, but how much you think." [1985, 77] She goes on to observe, however, that this will require changes in training,
rewards and roles. The distinction between automating and informating, and its implications for systems implementation provide a useful framework for considering the cases in this chapter.

The examples that follow are static slices of a dynamic process of decision support experimentation within three companies. The strategies and components that are being tested and used are very different yet all have possible application to land acquisition decision making.

The research is based on the views of one or two key people in each firm involved in developing and modifying the innovative approaches. The focus, here is on the process of extending the range of technical support to decision makers. The relative value of the individual applications is not being evaluated.
CASE ONE: SITE-SPECIFIC SENSITIVITY ANALYSES

Mark Twain once said, 'You can't go wrong buying land, they ain't making anymore of it.' While that sounds like good advice, it isn't always so. Land in the south end section of Boston 130 years ago was valued at $2 per sq.ft. Today you couldn't give it away for a $1 per sq.ft. If that same $2 had been in the bank at 3.5% annual interest, today it would be worth $175.

[Maurice Freedman 1985a]

In a mature and active market, land development opportunities are harder to come by due to a complex regulatory environment and the scarcity of available parcels. In his years as principal in charge of the site engineering and environmental services staff at Sasaki Associates, Inc. (based near Boston), Maurice Freedman observed a steady increase in reexaminations of previously passed-over sites. These properties require "more rigorous evaluation techniques than the traditional 'rule of thumb' formulas applied to 'plug in' parcels (land with available utilities and access and nominal grading requirements)."[1982, 1] He goes on to observe, in a 1987 interview, that the influx of business school graduates into the field has further increased the need to make site evaluation more explicit since MBAs seldom are practiced in examining land features.

Freedman advocates a two-step evaluation process.[1985b, 1]
The first step integrates experienced-based judgment with computer generated information that can rapidly evaluate the interplay of alternative site premium costs. Then, quick sketches are produced that reflect the site design being considered.

Once a feasibility range is established, the evaluator would move on to a second step, a short-cut version of a pro forma analysis.

Conventional real estate economics does not provide an appropriate framework for isolating and analyzing or weighing trade-offs associated with land and the regulatory environment. Instead it examines the positive and negative cash flows over time through the entire life of a development project to establish IRR.

...[Freedman hypothesizes] that the comfort and acceptance by investors and developers of computer-generated pro formas for large and complex projects carried out over a decade or more, is created more by the ponderous weight of the document itself and page-after-page of reassuring numbers carried out to three decimal mathematical accuracy and precise bottom line R.O.I. than by any inherent predictability or reliability of such efforts.

...The most creative and least predictable part of the process, relating to manipulating the land and its associated legal rights, tends to be buried, desensitized and smudged in a single comprehensive developmental pro forma.[1985B, 1]

As an engineer, Freedman was bothered by the tendency of developers and lenders to ignore the impact of alternative site designs while putting great confidence in computer-generated printouts that transformed best guesses
into precise projections. Freedman began to develop his own series of PC-based models to assist in site feasibility testing. He directed his staff to use them in some of the client work.

Recently, Freedman joined the staff of an office developer, Edward Callan Interests. He continues to use and expand the models in his new position.

The first steps are to perform a site reconnaissance by professionals with the requisite skills to properly inventory the site as a resource and to establish a synthesis map which records the above as positive and negative potentials and which acceptably delineates the net utilisable land area that can be used for development.

Once this site resource analysis has been accomplished, site planning alternatives and feasibility testing can be explored. The conventional approach to this implies the preparation of sketch alternative site and grading plans, and road and infrastructure layouts which are then analyzed to determine infrastructure and grading costs. This procedure is costly and time consuming and often involves utilizing most of the study budget to sort through infeasible alternatives with little budget left to pursue and optimize the viable alternatives.

The process by which feasibility alternatives are identified can be systemized and expedited through the use of computer models. In order to do so, relationships among these three key issues must be quantified:

- terrain adaptability of the infrastructures and buildings (i.e. large vs. small building footprints)
- density and arrangement (shape) of the site plan in relation to infrastructure, and
- standards or levels of design quality for roadways and other site elements.

Furthermore, the analysis must be organized to answer these practical questions which stem from and
guide feasibility testing:

1. How many units or square feet of a particular use can be placed on the site?
2. Are the costs of infrastructure and grading reasonable in terms of the product produced?
3. Will the arrangement of buildings be attractive and marketable?
4. What are the economic impacts of project phasing or variable rates of absorption?

The answer to the third question is subjective and dependent on design judgement and experience. However, a system of microcomputer-based spreadsheet programs has been developed which not only effectively model and manipulate the key issues listed above, but yield objective answers to the other three questions...At the heart of site feasibility analysis, however, is the interplay of the three key issues mentioned earlier: opportunity for terrain adaptations, the site plan configuration, and chosen design quality. [1985b, 2-3]

The knowledge-based models developed and used by Freedman have applications in testing the feasibility of office, R&D, commercial and residential sites. Incorporated into these models are values based on experiential judgments. As a result, input requirements are expected to be kept to a minimum.

The programs are run on the IBM PC-XT with provision for projection scopes to enlarge the CRT image to increase participation by staff or clients. The models are designed to be user-friendly and interactive so that numerous simulations can be tried to determine the range of project feasibility.
The following is a list of Freedman models in use. (Sample Output is included in appendix A)
- Cost of single or double-barrel roadway section, including all infrastructure.
- Site grading premium costs for office or industrial buildings.
- Premium costs for structured parking on higher density suburban office sites.
- Site finish (parking, driveway, drainage, lighting, curbs landscaping, etc.) costs for office or R&D sites.
- Office, industrial or R&D building pro forma.
- Rough, static pro forma for residential property.
- Multiphase office, R&D or industrial park cash flow and rent analysis.
- A newly developed, prototypical residential decision support program for evaluating single vs multifamily site use (expert systems technology coupled with a knowledge-based shell).

Maurice Freedman wrote about the key benefits of these models:

Models the assumptions of the most experienced practitioner. The reliability of these assumptions have been verified in practice.

Establishes a framework for systematizing cost data so that feedback from actual construction costs can be generalized and updated for planning purposes.

Identifies what is 'important' early on in taking off quantities and researching costs for planning
projects.

Allows for quick and easy trade-off analysis, providing the user with a tool for [site cost] sensitivity analysis.

Allows exploration of many more alternatives than is otherwise practical which assures early identification of project feasibility and quick elimination of infeasible alternatives.

Assures maximum participation of the client in the feasibility study process.

Avoids reinventing the wheel - since calculation methods and presentation of results are clearly established.

Saves time and money in testing potential development alternatives and provides more reliable results. [1985c, 7-8]

It is Freedman's position that the probability of having a successful project is enhanced by using computer generated models as components of the site evaluation process because the creative abilities of the developer and site planner are freed up to choose from among the viable alternatives.

After Freedman left Sasaki Associates, use of this approach to feasibility analysis was reduced. The reasons cited by staff members were:

1) Little advocacy by senior management with departmental staff and clients.

2) Limitations of programs for certain applications. The "quirks" must be known and bypassed by the user to avoid sometimes irreversible errors.

3) Unappealing learning curve when compared to going the
"known" route.

4) Shared access to computers that is inconvenient.

The knowledge-based computer models are used, however, when several site feasibility scenarios are requested by a client or when numerous future changes are suspected.

IMPLEMENTATION ANALYSIS

<table>
<thead>
<tr>
<th>AUTOMATE (efficiency)</th>
<th>INFORMATE (=DSS) (effectiveness)</th>
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<tbody>
<tr>
<td>TEST a greater number site plan alternatives</td>
<td>more comprehensively.</td>
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<tr>
<td>PC-based to encourage individual use by site designers; flexible data administration.</td>
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IMPLEMENTATION Black box to most users; designer=owner; central use of PCs.
The original goal was not fully realized in part due to the limitations of the software. It continued to evolve. Bugs had to be worked out and it was not considered easy to use. In order to conquer the learning curve, practice was important, but terminals were not always available when needed.

Freedman had acted as a self-appointed champion of the use of computer models in testing site feasibility. As a principal and head of a department, he was in position to influence policy. Although he had the authority to act as a sponsor for use of the models, he was not an effective champion for most of the staff. His technical skills as the designer of the system were "so superior that followers could have little hope of emulation." [Leonard-Barton and Kraus, 1985, 105]

As a result of these factors, the DSS was not "institutionalized" at Sasaki and is not often used since Freedman left. He, on the other hand, was able to bring the skill to a new position and is using the same interactive approach on a PC to understand unfamiliar aspects of his new job.
CASE TWO: "20% in Real Estate - But Where?"

[Hudson-Wilson and Greenwood 1986]

Simply because an economy is experiencing growth does not necessarily mean it is a good real estate market. We are no longer in the 1950's and 60's where the economy was growing so rapidly that mistakes were easily hidden--or even the 1970's when we had inflation to ease the pain. The need for additional buildings is decreasing while preferred location and type are changing over time.

People can migrate. Buildings cannot. Developers have this wild west mentality that they are somehow going to beat the supply and demand system.

[Richard Gold 1987]

In 1983, a new senior manager in the Investment Division at the UNUM life insurance company based in Portland, Maine established a departmental objective to create "a consistent data series that could capture historic and prospective differences in real estate markets." The statistic, called The Real Estate Market Index (REMI), was developed to help determine optimal portfolios that would be both return maximizing and risk minimizing. In its ideal form it would be an accurate description of the various real estate markets that would increase awareness of their past and act as leading indicator of their future.

The ideal series would be available over time and would be as specific as possible with respect to structure types and geography. In addition, the series would be able to be disaggregated into meaningful component parts so that causal relationships between the supply of space and the demand for space might better be revealed. The series should bear a close relationship to real
estate returns - particularly given the desired end use in the construction of optimal portfolios.

In theory a real estate return series purged of the effects of financing and consistent over time, space and structures would be the most appropriate tool...a very high quality vacancy (or occupancy) rate statistic, carefully maintained using consistent technique for every structure type in every county by an independent and objective group. [Hudson-Wilson and Greenwood 1986, 4-5]

Unlike the Dow Jones, it could be disaggregated by markets. This would make it possible to adjust portfolios according to projections of future volatility in particular markets across property type.

A regional director, Hudson-Wilson, has continued to develop the concept for several years using asset allocation models from the field of stocks and bonds. Being able to compile consistent and reliable regional databases is considered critical to reducing the cost of information.

The REMI may be thought of as a vacancy rate proxy in that it measures the relationship between the supply of and the demand for square footage. The REMI is constructed by separately building the supply of and the demand for space. The concept can be constructed monthly, quarterly or annually (depending on demand side data availability) for counties, MSAs, states or the nation, for over 200 structure types.

The supply side is constructed using the McGraw-Hill F.W.Dodge contract awards data...[to formulate] an historical, put-in-place flow series...

The demand side is constructed using basic labor market and demographic information. For each structure type an appropriate 'driver' is used. Changes in the volume of demand from period to
period are translated into square footage terms with a scalar representing average space used per user... Each geographic area uses the specific scalar calculated for that geographic area and structure type...

This marginal demand series may be plotted and compared (on one graph since all orders of magnitude are comparable) with the marginal supply series. It is now possible to begin to draw inferences about the adequacy of supply relative to demand and to compare supply and demand cycles...

The final stage in the construction of the REMI involves the conversion of the flow concepts of supply and demand into more of a stock concept. This is done quite simply by calculating a moving sum over 5 years of supply and an identical moving sum of demand. [Gold has expanded the timeframe to up to eight years in some markets.]

The most important contribution of the REMI is its uniform construction over geographic areas, over time...

The exercise of forecasting the REMI does address sensitivity questions and so provides insight on the probability of various events. Since the REMI is constructed from component parts and is not a reduced form like a vacancy rate, it is easy to develop scenarios on the supply or demand side...

[Hudson-Wilson and Greenwood 1986, 5-12]

The REMIs at UNUM have now been under development for four years and are being used to evaluate acquisitions. Over 1500 REMIs have been calculated for 305 metropolitan statistical areas. A new study underway models 62 of the cities for five structure types using somewhat different methodology. Gold, a real estate economist, has joined the staff and is expanding and modifying the models already under development. He has a dumb terminal connected to a national information service, Dodge/DRI, as well as an in-house work station that
includes statistical software and an IBM PC. (For a similar set-up it is estimated that an organization needs a budget of about $200,000 annually.)

The sample cities Gold screened in this study were selected heuristically by the regional directors. Each regional director currently uses the information generated by the models to narrow the number of markets targeted for field work. Selected markets must have a positive economic forecast for more than one structure type so that staff time can be used efficiently. (Any existing relationships with joint venture partners in specific markets, however, will also be factored into acquisition decisions.)

When the field work is complete, and potential properties identified, the regional directors will present acquisition opportunities to each other and senior management. Using a combination of experiential judgments and computer-based portfolio optimization techniques, a group of projects will be selected for purchase within the next few months.

Despite an interest in portfolio optimization techniques, informal information gathering (through field work and the regional network) continues to be a highly valued site-specific information source. Regional economic information, however, comes directly from the analyst through
the models. Gold believes, "All models have a signature and all forecasts come with a story." [Gold 1987] In real estate economics, numerous proxies substitute for data that is not available. According to Gold, the model-builders know the components that are less reliable, what mitigators may have to be added and when the data is being "tortured" too much. He suggests verbal presentation whenever possible to supplement hardcopy so that others can be informed about the unique aspects of a given model. In this way the analyst can make implicit assumptions and methodologies, explicit. Gold explains that his position and department are necessarily isolated so that office politics and priorities will not impose themselves on the forecasting.

Hudson-Wilson emphasizes that the models are still evolving. She and Gold occasionally disagree on the optimal techniques to be used. The debates serve to fine-tune procedures or test alternate approaches. Assumptions and databases are frequently evaluated and the approach modified when appropriate. The technology is viewed as a tool that can make diversification progressively analytical, rather than accidental. It is expected that use of this tool will increase overall performance significantly in the long term.
IMPLEMENTATION ANALYSIS

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BUSINESS GOAL

to increase range of analysis

TECHNOLOGY DESIGN

requires technical flexibility in expert to operate modeling

IMPLEMENTATION

designers=owners

The systems design does not encourage user, hands-on learning. The analyses are primarily done at one work station using terminals, models and prepackaged statistical software that require expert analytical skill to monitor the technical interactions. On-line use of the remote database is pro-rated by intensity of use - mistakes are costly. The environment is not friendly to non-expert experimentation.

Except for the few who were in on the development of the REMIs, the computer output presents a bottom-line evaluation. The process is not interactive for most of the staff.
Although one of the goals of the system was to act as a tool for decision support, the economic models and the analyst who uses them to reveal market information, continue to be viewed as a black box by most of the end users.

The designers of the system are experts of the technology and of the principles of economics. As in Case One, they operate with a knowledge base that is seen as "too big a reach" for the typical staff member. This discourages emulation.
CASE THREE: 20/20 HINDSIGHT

There are four types of components in any system: believable, perceivable, conceivable and leavable.
[Roy Morian - student quoted by Thomsett 1980]

A national, commercial developer decided, in 1982, to update and expand its computer system. Allocating $3-$5 million with a three year time horizon, the company planned to automate and centralize its financial and asset management tasks. Once a database was created to monitor national real estate assets, information could be retrieved quickly to evaluate market conditions in a particular region. This information, such as lease terms, could be used when decisions had to be made on acquisitions or refinancing.

No commercially available software was found to be appropriate so the firm began development of customized programs. In less than three years, the systems development staff had expanded from 15 to 105 and over $10 million had been spent. The projections indicated that another $10-15 million, and another 3-5 years, would be needed to complete the system. Something had gone awry. In hindsight, the
following problems were identified:

1) The hardware and operating systems that had been used and were being upgraded, did not have the size and power to handle the systems requirements. Digital Equipment Corporation had planned to develop more powerful hardware but those plans were abandoned and users were encouraged to migrate to VAC systems. The VAC system was not compatible with what had been developed.

2) The systems planners had seriously underestimated the resources necessary to accomplish the goal using the existing technology and custom programs. The planners did not have sufficient expertise in the requirements of such a system.

3) The centralized design of the system did not fit company culture. Regional offices were encouraged to be somewhat entrepreneurial and did not want to conform to a national processing schedule. More importantly, they wanted local control over the system. Corporate officials wanted financial control to be maintained at headquarters, and therefore, had tried to implement a large centralized database.

4) The financing of the system was too indirect to immediately affect the regional offices that would have to assume the costs. It had been funded almost like a construction loan. Only when the system was up and operating would the costs be charged out to systems users.
Since the end-users were not writing checks during the design phase, they were unmotivated to make inputs into the process.

In late 1985, a rigorous reevaluation of the situation was undertaken. It resulted in scrapping the technology and system under development in favor of a decentralized approach using seven IBM Systems 38 and a staff pared down to 25. The original goal of creating a single national database was abandoned. With this design, also costing about $10-15 million, there is more duplication of inputs and data. However, the decentralized database is a better fit with company culture. This was a critical factor which made possible the implementation, now nearly complete. Regional users have taken keen interest in this design because they are funding it directly while also paying off the costs of the abandoned system - definitely an attention getter!
IMPLEMENTATION ANALYSIS OF THE ORIGINAL SYSTEM

<table>
<thead>
<tr>
<th>AUTOMATE</th>
<th>INFORMATE (=DSS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(efficiency)</td>
<td>(effectiveness)</td>
</tr>
</tbody>
</table>

BUSINESS GOAL  centralize and monitor-----new source of information

TECHNOLOGY DESIGN  central database with
no regional input into
the design; top-down

IMPLEMENTATION  controlled by experts;
pay for it but do not participate.

Although many misjudgments were made in the decision process, the key obstacle to implementation was attempting to adopt a system that did not fit the corporate culture. A business strategy of decentralization is credited with creating the strength of the company yet this "grass roots" strength was not tapped in designing and implementing the original system.
SUMMARY OF MINI CASES

The barrier to system implementation is often a mismatching of technical design to business goals or corporate culture, rather than the inadequacy of the technology to perform the stated tasks. When the business goal is to "inform" or to "enhance effectiveness," the technology design must be conducive to user interaction. If the equipment and software are so complicated that only a technical expert can operate them or if access is limited and inconvenient, then the system is centralized. As Chapter Two pointed out, decentralization is demonstrably more supportive of decision makers than centralization.

The concept of user involvement in systems design and in implementation planning is at least ten years old. This involvement eases the transition and compels designers to better understand the needs of users at all levels of the organization, not just senior management.

It is crucial, then, not only to perceive the benefits of incorporating a system that can support decisions, but also to make sure that it is compatible with the values and objectives of the organization. Companies that carefully select technology and implementation plans appropriate to their style and goals, position themselves to realize their systems's full business potential.
CHAPTER FOUR

A FUTURE FOR DSSs IN LAND ACQUISITIONS?

If I had to start all over in land development today I don't know that I would do it. I am too impatient to deal with the complications and concessions. The approval process is four to ten times as long as it was when I planned Laguna Niguel. It's an awful nuisance.

Don't get me wrong. Developers brought a lot of this on themselves. Too much attention is focused on how to maximize profits and not enough on liveability. Developers should also ask, 'How can this project make people's lives better?'

[Gerald Blakely 1987]

The type of data needed to supply relevant information in the present-day real estate market is extensive and impractical for a developer to collect. Developers not only need site-specific information with each potential acquisition, but also current regional statistics on demographics, employment growth or decline, and the projected future supply of competitive projects. Forecasts are ideally accomplished using comprehensive, well-maintained and up-to-date data which has been, in most cases, non-existent or inaccessible. Even when it is available, the cost of the technology and staff needed to maintain and analyze it has been prohibitive. Technological changes are taking place, however, that can significantly increase a developer's access to large databases within the next five years.
More accurate and timely information for decision support in land development depends on three major factors:

1) Comprehensive, current and well-maintained databases.

2) Enhanced technology that is user-friendly, preferably microcomputer-based, and capable of interacting with large, remote databases.

3) An on-going, in-house implementation plan.

Although use of decision support systems in land development is only in a pioneering stage, enhancement of PC hardware and software, and advances in public and private data systems will make the use of information technology in this field more widespread.

In Chapter Three, the findings from the mini cases pointed out the organizational issues that can prevent successful implementation even after the technology is available. This phenomenon is not unique to real estate companies and has been analyzed extensively by management experts. In this chapter, the focus will be on the other two factors: enhanced technology and more accessible databases.

REMOTE DATABASES

As the cost of computers decreases and technological capabilities advance, public and private databases increase in number. Many major cities have at least one privately run computerized real estate information service that "provides
real estate and sales data based on government assessments and deed records, supplemented by other sources" [Godschalk, Bollens, Hekman, Miles 1986, xi] and almost all communities have multiple listing services to advertise residential and commercial properties for sale. Typically, these databases are either special purpose or have relied heavily on the available public sources of data. Because land developers and their consultants are dependent on jurisdictions for much of the information needed to select and process a site, this section focuses on the implementation of data systems at the local level through public agencies. (Evaluating private systems would be another worthwhile research topic.)

LAND USE INFORMATION SYSTEMS

Automated land supply information systems (ALSIS) are defined as computerized databases designed to monitor changes in a jurisdiction's land inventory, in order to assist in management and regulation of land development and to facilitate analysis of private market decisions. They enable decision makers to understand the impacts of public policies on the amount, price and location of land available for development. They enable developers to reduce the risk, uncertainty and expense of private development projects. [X]

Numerous interest groups from both the public and private sectors are advocating the implementation of land data systems. Policy makers, lenders, surveyors, farmers, environmentalists and others are concerned about the effective management of land supply which depends on current
and accurate data.

A growing number of public and private computer-based systems have been set up to monitor development and provide land market data. These systems, feasible because of advances in computer technology, are powerful policy and decision analysis tools. [1]

Bollens and Drummond have suggested that the functions of a land data system are:

1) Real property assessment (valuation)
2) Land planning and regulation
3) Natural resources conservation
4) Real estate market analysis
5) Public facilities planning (transportation, utilities)
6) Project (site) planning
7) Archiving (land title records)
8) Academic research.

Each community would have to prioritize the functions according to local concerns and decide on the components of the system such as whether a geographic mapping capability would be integrated into the system or whether demand would be tracked as well as supply.

Currently, metropolitan areas, with populations of 100,000 or more, are increasingly automating their land records. In 1983, a study was done at George Mason University in Virginia. It found that "well over half of all cities and counties have a computerized system in operation, are
developing one or are planning to do so soon. The existing software and hardware has brought the cost of planning information systems within the reach of nearly all local governments." [Hysom and Ruth 1984. See Gebert, Gordon, ed. 1984]

Informed communities are finding that the cost of not developing an automated land supply information system is also high. Duplication and lack of records coordination within the departments of the same jurisdiction is costly, inefficient and an impediment to effective long range planning.

Also, if accurate, timely and comprehensive land supply and demand information is available to both the public and private sectors, "proper consideration can be given to the market impacts of development restrictions and incentives" as well as to improving the accuracy of public facilities decisions. Over-constraining the land supply can inflate land prices and unnecessarily redirect development.

Risk and uncertainty make development more expensive. The consumer pays more for housing since higher risk projects require higher investor returns. Market uncertainty limits competition and forces the developer to pay more for land if the market is artificially constrained. The government pays more for public facilities when they are not properly sized due to uncertain knowledge about the actual supply of land available for development. As each decision maker adds 'safety factors' to compensate for missing information, affordable housing opportunities shrink.

[Godschalk et al. 1986, 2]
It is important, then, that the land data system have "a definition of available land supply that is mutually agreed upon by government and private interests." [62] Typically, all unimproved or underutilized parcels are considered developable by planning officials. Using this logic, owner intentions, site constraints and economic feasibility are not taken into account. These are all real factors which influence the likelihood of parcel development. If they are not considered by planning officials, inaccurate assessment of the amount of developable land will result.

A study in Stockton, California did take these additional factors into account and concluded that only 36% of the holding capacity of vacant land designated residential on the Stockton General Plan, was likely to be built [24]. Zoning decisions are based on the General Plan, not on the study. This is too large a discrepancy to be ignored. If the study is accurate, there may be significant over constraining of the land supply.

Planning departments concentrate on quality of life issues and general economic and demographic trends. Often, planners give scant attention to the economic dynamics of individual parcel development. Developers (as Blakely points out) tend to be myopic about the financial performance of specific projects and not attentive to the way the project fits into
the greater good or even the macro economy. In designing systems to monitor land supply, it is imperative that both private and public interests are represented so that reliable information for decision making will result.

As the price of automating land data declines while the number and complexities of transactions rise, the benefits of land information systems will begin to outweigh costs. Paralleling individual companies, the design and implementation plan must fit the needs and culture of the agency-users. Over the last ten years, the pioneers have found that a holistic design and a modular and evolving implementation has more chance of success. Lincoln Institute of Land Policy and others are interested in developing a dissemination program so that communities can exchange experiences and learn from each other. This could shorten the process and perhaps begin to standardize approaches so that land monitoring issues can be viewed with a broader perspective.

THE ENHANCEMENT OF MICROCOMPUTER HARDWARE AND SOFTWARE
If well-maintained regional databases were available, land developers could address many items on their wish lists most effectively through interactive access to reliable and current data. Within the last few years, predictable advancements in computer hardware and software have made
possible the use of microcomputer technology to manage larger volumes of data, and to interact over networks with databases managed by some other public or private organization.

In the past few years, PC evolution has been rapid. IBM has already released a second generation of PC. They also have announced a new multitasking, graphics-oriented operating system (OS/2) that will support the 32 bit 80386 chip. Other manufacturers such as Macintosh are introducing variations on the same theme. These enhancements allow users of microcomputers to run more than one software application at a time and access remote databases. Integration capabilities, in other words, are built into the hardware. Without this, the alternatives have been to perform applications separately and move static files from one program to another, or try to use available integrated packages which are generally considered a compromise of the best, individually-packaged tools. Another option for those with an adequate budget, has been to have an expert build a custom application package. Specialized packages are usually difficult for users to amend if contextual changes occur and probably will not be able to interact over a third party network.

With enhanced hardware capabilities, the missing link is advances in database query language application tools. Advances are expected to come from large commercial hardware
and software vendors within three years. (Ferreira, 1987)

This non-procedural language will allow a user to make statements that the program will translate into a complicated series of steps. Then the program can interact with another application package or a remote standard database if the format and content is known. Ferreira described the situation:

The software design issues are too new to have gelled so that the right way of constructing the relationship between all these pieces at the PC level is economic, user friendly and relatively painless to link the analytical side to the design side. The best tools [software packages] do not have automatic hooks into each other. Not only do you need some expert to connect them, but it is more painful than you would like. It will take a few more years to find some standardization about the way packages will trade information. I believe the PC is the proper pathway for evolving these interactive tools. [1987]

Hardware already has the power and capability, to efficiently perform multitasking (performing more than one application interactively). Software, specifically designed for land acquisition analysis, and public or commercially available relevant databases are the bottlenecks. When these bottlenecks are addressed, the following scenarios will be possible:

1) A land developer, while performing financial feasibility analyses of potential sites on an electronic spreadsheet, could call up data from a county database containing demographic or current land sale information or the outcome
of a recent hearing. While waiting the few minutes for the results of that inquiry to be automatically plugged into the model (or maintained separately as appropriate), a local applications package such as Lotus could be running. If the information received from the remote database indicated that the project was outside the parameters of feasibility, another scenario could be tried and additional data requested.

2) A land developer could decide to change the design criteria on a planned project. The graphics editor, on a system such as Autocad, could be linked to a pro forma on an electronic spreadsheet (e.g., Lotus). The financial impact of making design modifications could be immediately determined by monitoring the automatic changes made to the spreadsheet. Again, if the results were unacceptable, a design variation could be tested.

3) A land developer could be prospecting for new sites. Based on corporate planning or intuitive guidelines, a public or private database could be queried to identify owners of parcels that meet a set of criteria. For example, the following could be readily queried: within one mile of an interstate in a particular county - vacant or underutilized - within a half mile of an elementary school. Combinations of criteria could be selected to develop a priority list of
potential sites. If the jurisdiction had a geographic information system it might even be possible to designate areas and then screen the parameters. These potential sites could be further linked to local sales information or public facilities planning.

WHY WAIT?
A number of arguments can be made for waiting until all the components are in place before integrating support technology into a development office. Management may believe that it is a waste of staff time to build new computer skills in advance of their need. There is also concern about the cost of updating technology as improvements are made available. Many want to wait until the "perfect" system for their needs is fully developed. Then they can simply buy it and plug it in - not a realistic alternative.

Even more pervasive in land development is the dealmaking culture that takes pride in the inexplicit, experiential judgment approach to acquiring land, which is sometimes characterized as a talent that "either you have or you don't." If technology can be used to support acquisition decisions, then it implies that at least some of the analysis can be made explicit and learned - a notion not readily accepted by some developers.
Running counter to those arguments are commonalities from the interviews summarized in Chapter One. There are areas where better information could make a difference, such as forecasting market acceptance, competition at completion, and the amount and type of concessions expected by the community. If accurate and timely data is combined with an appropriate statistical package, scenarios (of the optimistic, most likely and pessimistic) used by developers would better reflect the true range of possible outcomes.

Better information would most affect deals at the margin. For instance, more current and accurate data on projects in the pipeline might signal a "go/no-go" decision or change of use for a project that was marginally beneficial or profitable. On the other hand, skilled and creative data analysis might reveal a short term window of opportunity in a specific market for a particular use at a price that is perhaps higher than intuitively projected.

SUMMARY
Before technology can be useful the site selection process must be evaluated to determine which parts of it can be made explicit and systemized in order to be supported or "informated" by a technological tool? Microcomputers-- the technology of choice for the typical developer-- have the
potential to significantly impact the process of property acquisition. When PCs are linked to remote databases or programmed using the experiential judgements of the "master" land developers, analysis can be enhanced in all stages of the process - from prospecting for parcels, to interactively testing site and financial feasibility, to forecasting the dynamics of regional markets.

Developers, with their needs to keep track of large amounts of data yet operate entrepreneurially, are in position to greatly benefit from PC advances. So far, however, little thought is being given to how these new tools can best be used in land acquisitions and how software innovations, related to the real estate field, can be encouraged. Further research could be important:

What is on the checklist of criteria and by what process is it analyzed?

How fundamentally is land development changing due to the complexities of the regulatory environment and the interactions of markets?

Are future land developers apt to be dispositionally different from those who have gone before, and if so, what new methodologies will they use in decision making?

Who will control future sources of funding and what additional requirements will they make?

Who will control future sources of information and will
the information be accessible?

And most importantly,

What specifically can developers do today to assure that information critical to land acquisition decisions is available in the future?

The technological advances that are currently taking place in microcomputer hardware and software, can have significant impact on the way land developers make acquisition decisions. Instead of merely managing risks, uncertainties can be reduced if well-maintained databases are combined with in-house tools and techniques for transforming the data into information. The alternatives to becoming better informed in competitive regions are either to let the market painfully correct misjudgments or to adopt a conservative strategy.

The challenge for the land developer is to be proactive in shaping the future acquisition process rather than react after changes are in place. Just as it is important for potential users to be involved in design and implementation planning within an organization, the same needs exist when using systems external to the organization:

1) At the jurisdictional level, cooperation in monitoring land supply should be established in a non-site specific
context. Developers should become advocates for representation in the design and implementation of local land information systems. With the release of PCs that can manage large volumes of data and use remote databases to supplement localized applications, a new and important information source could be available in the near future. Developers must decide what pieces of this information could be useful to them and understand enough about the technologies to intelligently recommend the inclusion of data management components beneficial to private interests.

2) At the individual firm level, an environment that encourages technological experimentation can have advantages for the individual and the company. Implementation of any technology should be consistent with corporate culture. Users must be convinced that the benefits outweigh the effort required to tackle the learning curve of a new system. Users should have input into the design of the technology and participate in implementation planning. If senior managers pay careful attention to systems design and to the implementation planning process, they are more likely to realize their informate goals. This will result in an expanded range of analysis and a systematic method of transferring some of the components of their experiential decision making to others.
3) In seeking project funding, more persuasive arguments can be made to lenders if market variables can be better forecast. Many believe that this latest round of office overbuilding will lead to more lender sophistication about the type of market analysis required. Those developers who accurately model regional markets will have the competitive advantage with real estate investors and lenders.

The hope is that factors considered in the process of land acquisition can be supported and modeled as routinely as pro formas. This can free up the inventive energies of the developer and extend the range of analyses used to make a decision. Obviously, computer technology, no matter how good the information source or how enhanced the technical components, does not now, nor will it ever, duplicate the complexities and nuances considered by a land developer. But it can make a difference in how some of those factors are evaluated and understood, and may well be an important component of competitive advantage in the 1990's.
APPENDIX A

Figure 3. Structured Parking Ratio Model

Vertical axis shows the amount of structured parking needed per buildings of known height and F.A.R. This statistic can be applied to the cost of structured parking in order to determine a structured parking premium cost.

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AREA OF STRUCTURED PARKING [IN SF] REQUIRED PER BUILDING 5SF

(30% open space; 3.5 car spaces/1000 bgsf; 35% use by small cars)

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87


