REAL ESTATE DEVELOPMENT FIRMS AS LEARNING ORGANIZATIONS: SYSTEMS THINKING AS A METHODOLOGY FOR STRATEGIC PLANNING

by

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Bachelor of Science in Civil Engineering
University of Santa Clara
1983

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by

LIAM THORNTON

Submitted to the Department of Urban Studies and Planning on July 31, 1992 in partial fulfillment of the requirements of the Degree of Master of Science of Real Estate Development

Abstract

The current oversupply in the commercial real estate market has been produced by a combination of a cyclic real estate market and strong supply side reactions to the various signals in the market. These supply side reactions are caused in part by difficulties in evaluating the combined effects of the financial, economic, market and political systems upon the real estate development process. While experienced real estate professionals have expertise in individual aspects of the development process, the inability to understand these individual components when combined in a complex system can often result in inadequate strategies based on the use of heuristics or judgment rules to simplify the decision making process. This thesis identifies organizational learning disabilities that influence developers' mental models and cause less than optimal development decisions.

Primary research of major real estate development firms is employed to ascertain the validity of the hypothesis. This empirical data was obtained through personal interviews with executives of real estate development firms in the U.S. that are involved in the decision to develop. The interview results provide insight into the mental models of real estate professionals and their level of understanding of the complex systems in which they operate. In particular, the interviews attempt to ascertain whether or not the developers, after the collapse, have achieved an understanding of the dynamics of the real estate market and their supply side contribution to it. It also seeks to determine whether any individual or institutional learning has occurred that may influence future decision making.

Literature research first explores the looped learning concept and how professionals learn from experience. Second, it provides a general explanation of the feedback concept, systems theory, systems thinking, and the methodology of system dynamics. Third, the real estate development process is analyzed in terms of a dynamic complex system.

In conclusion, a prescriptive approach of systems thinking is offered as a tool for strategic planning, decision making and management in real estate development. System dynamics is demonstrated as a methodology whereby tacit mental models are made explicit through the modeling process. By making relatively vague and ambiguous judgment of managers explicit, institutional learning may occur. A real estate learning laboratory, facilitated by system dynamic modeling and scenario planning can provide a low cost environment in which to challenge assumptions and take strategic risks.

Following the conclusion, the current status of systems dynamics research in the fields of real estate development and urban planning is briefly addressed and a direction of future areas of research identified.

Thesis Supervisor: Dr. Gloria Schuck
Title: Lecturer, Department of Urban Studies and Planning
Acknowledgments

I always wondered why authors would include a page or two in the beginning of their work thanking assorted people for various reasons. After enduring the thesis process, I now understand. There are many people who contributed to this document.

Special thanks go to the executives of the real estate firms interviewed. Their very candid responses form the nucleus around which this thesis is developed. All of them spent an extremely generous amount of time with me answering difficult questions that probed their decision making process. The honesty and openness of these responses is self evident in Chapter 4.

Gloria Schuck, my thesis advisor took the risk of allowing me to research a less than mainstream topic, the application of systems thinking concepts to real estate development, and to venture into unexplored academic territory. Her encouragement, insight, and willingness to approach new ideas was instrumental in the development of this document. Gloria, thanks for taking a chance.

Professor John Sterman, Director of the System Dynamics Group at the Sloan School of Management introduced me to the concepts of systems thinking and system dynamics in his introductory spring course. His patience and support in allowing me to apply the systems thinking tools to real estate development is greatly appreciated. I am also glad that John allowed me to stay in his class even though it was oversubscribed at the beginning of the semester!

Michael Rubin, Ph.D. of Molinaro/Rubin Associates, Inc. introduced me to the applications of scenario planning to real estate development in his course at the Harvard Graduate School of Design and in subsequent discussions. His enthusiasm for my topic of research and the personal time spent with me is gratefully acknowledged.

Peter Genta of Gould-Kreutzer and Associates, an alumnus of the MIT Center for Real Estate, is responsible for the system dynamic model that is used as an example in the final chapter. Peter is presently using system dynamic modeling as a management consulting tool. Peter's help in developing the model and his personal interest in the subject matter is sincerely appreciated.

Pamela S. McKinney, MAI of Byrne McKinney & Associates, Inc. in Boston provided helpful personal insights as well as formal data on real estate market analysis and forecasting.

Larry Hirschhorn, Ph.D. at the Wharton Center for Applied Research provided me with some of his past and present research on scenario planning applications for development.

Thanks go to Tom Steele for his continued interest and support as my faculty advisor throughout the year.

Heartfelt thanks go to my father and mother, Tom and Mary Thornton who taught me to believe in myself and also to question everything. Those teachings were enormously useful in the researching and writing of this work.

Finally, I owe the greatest thanks to my wife Felicia whose support, friendship, and belief in me are always inspiring. It is not a cliché to say that I couldn't have done it without her. Thanks, Felicia.
For Felicia
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Current literature in real estate identifies the apparent inability of the development industry to identify past mistakes and learn from them:

"Even with our expectation that construction will be cut in half, forecast demand levels on a purely statistical basis preclude the total U.S. [office] vacancy rate from dropping below 15 percent before the year 2022."

"Where is it written, thou shalt overbuild?"

"As important as optimism is to developers, it can be one of the most likely causes of their failures. Combine optimism with someone else's money, and you have the ingredients for a potential business disaster.....In my years of experience as a consultant, I frequently have encountered a phrase that characterizes the 'skilled incompetence' of some developers. The phrase is 'developer's disease,' and it reflects a developer's inability to look objectively at market and financial facts and act on those facts accordingly. A developer with developer's disease typically brushes aside any information that suggests his proposed project may not work and then unintentionally covers up the fact that the information even exists."

The financial institutions are not without fault:

"One adviser believes that developers, eternal optimists, will keep building as long as someone provides the financing. 'I hope,' he adds, 'those doing the lending will restrict themselves, but I would be surprised if they've learned anything.'"

"...whenever investors are swamped with funds and are rewarded for placing them, they will keep on placing them regardless of the prudence of the deals involved...."}

lending officers swamped with money can't make good
deals, they will make bad ones; if they can't make bad ones,
they will make terrible ones; if they can't make terrible ones
they will make horrible ones--but they will make deals.\(^5\)

The U.S. commercial office market had an average vacancy rate of 18.2% at the
end of the first quarter of 1991[see Figure 1.1 on the next page].\(^6\) This oversupply in the
commercial real estate market has been produced by a combination of a cyclic real estate
market and strong supply side reactions to the various signals in the market. These
supply side reactions are caused in part by difficulties in evaluating the combined effects
of the financial, economic, market and political systems upon the real estate development
process. While experienced real estate professionals have expertise in individual aspects
of the development process, the inability to understand these individual components
when combined in a complex system can often result in inadequate strategies based on
the use of heuristics or judgment rules to simplify the decision making process. This
fragmentation of knowledge of "the building professions, the building process, and the
built environment is one of the fundamental problems of the building industry today."\(^7\)

\(^5\)Anthony Downs, *What Have We Learned From the 1980s Experience?*, Salomon Brothers Real Estate
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<th>Rank</th>
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</tr>
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<td>6</td>
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**National CBD Office Vacancy** 18.2%

FIGURE 1.1
Real estate development is a complex process yet the management tools used in the development process have historically been less sophisticated than those utilized by other industries. Consider the paradox of the following statements:

"Land development is an extremely complex process involving numerous decisions and actors. It can be viewed as a production process, where land is purchased as an input to the production of either finished [structures], but the actual process is not that simple. Land developers are faced with problems unlike other manufacturers."\(^8\)

"Virtually every segment of society is more information sensitive. Just as real estate has lagged in the application of management techniques and theories in the industrial era, the real estate sector seems to be lagging in the application of information to real estate decisions in the information era."\(^9\)

In addition to the difficulties of handling complexity as well as the sub-optimal use of traditional management tools, the developer must struggle with organizational "learning disabilities" that are characteristic of real estate development firms. Some of these learning disabilities are organizational and some are due to individual "cognitive biases"\(^10\) that influence managers' judgment.

This thesis is organized into five chapters, beginning with the introduction. **Chapter Two** researches the literature on individual and organizational learning, creativity, problem solving, and decision making, and identifies impediments to the same. This chapter is necessary to set a framework to recognize the organizational learning limitations of real estate development firms interviewed.

**Chapter Three** provides an overview of systems theory and systems thinking, culled from the current literature. This chapter builds on the previous by suggesting that systems thinking is an organizing framework and language for creative and insightful

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problem solving. The intent of this chapter is to provide the reader with an elementary understanding of the systems thinking viewpoint and the system dynamics methodology. This thesis is not offering new theory, rather it is taking existing theory (systems thinking) and applying it to the real estate development industry, specifically the development decision process. Hence, a cursory review of the fundamental concepts of system dynamics, which are assumed to be relatively unknown to the real estate professional, should allow the reader to better synthesize the field data provided in Chapter Four. In illustrating the concepts of systems thinking, this thesis makes liberal use of analogies that are not specific to real estate but are assumed to be a part of the readers experience. It is felt that new concepts such as systems thinking are best understood when linked with something the reader already knows.\textsuperscript{11} Systems thinking concepts, once explained, will then also be described with real estate applications.

Chapter Four provides the results of interviews with real estate development firms on the West and East coasts of the United States. The broad purpose of the interviews is to determine the mental models of real estate developers and how these models are influenced by the development system environment. The field interviews utilize a framework of questions intended to elicit developers' (1) understanding of the development system, (2) internal vs. external orientation, (3) use of intuition vs. analytical reasoning, and (4) conceptual blocks or perceptual biases that inhibit the learning process. This chapter includes an analysis of the field research data, integrated with the theory and concepts of organizational learning and systems thinking.

Chapter Five provides conclusions based on the analysis of the field research and offers systems thinking and system dynamics as a methodology for improving the mental models of real estate developers through the strategic planning process. Systems thinking, incorporated into the strategic planning process through the integrated use of scenarios and computer modeling tools, is proposed as one method to improve individual

\textsuperscript{11}Seymour Papert, \textit{Mind-Storms}, New York: Basic Books,1980, p.120.
and organizational learning. A simple dynamic model is provided to illustrate the use of systems thinking in real estate development. However, the purpose of this thesis is not to develop a new complex system dynamic model but rather to introduce the system dynamic modeling process to real estate development strategic planning. Detailed system dynamics real estate and urban development models have been developed by others [Bakken, Genta, and Forrester]. Following the conclusion, future areas of research of the applications of system dynamic modeling to real estate development and urban planning are identified and discussed.

Individual and Organizational Learning

This chapter looks at learning, creativity, problem solving, and decision making as well as individual and organizational obstacles to the same. It is anticipated that the reader may be skeptical that these theoretical concepts have practical applications to real estate development and, therefore, citations from real estate sources which support the conclusions from these concepts are provided. First, experiential learning is discussed in the context of the individual. Barriers to learning are then addressed. The concept of organizational learning is developed and some of the "learning disabilities" that exist in real estate development organizations are presented with references to the individual conceptual blocks that comprise these organizational disabilities. Some of the organizational barriers to learning will appear to be the same as those of the individual.

Experiential Learning

The model for individual learning that is offered in this thesis is the looped concept of experiential learning espoused by David A. Kolb. Kolb draws from the research of Kurt Lewin in defining experiential learning as a four stage cycle as illustrated in Figure 2.1 the following page.\textsuperscript{15}

FIGURE 2.1

In tracing the loop on the Lewinian Experiential Learning Model, one notes that concrete experience leads to observing and reflecting about that experience. Based on these observations, one forms new or modifies existing concepts and generalizations (theory). This theory is then tested in new situations and the testing in these new situations results in the formation of another concrete experience.

In developing this concept, Lewin emphasizes the notion of feedback. According to Kolb:16

"This information feedback provides the basis for a continuous process of goal-directed action and evaluation of the consequences of that action. Lewin and his followers believed that much individual and organizational ineffectiveness could be traced ultimately to a lack of adequate feedback processes." [emphasis added]

This concept of feedback is an important one in the systems thinking methodology and will be expanded on in the next section. The emphasis here is that experiential learning is a process (not an outcome) where concepts are constantly being

16David A. Kolb, Experiential Learning, p.22.
evaluated and revised based on an individual's experience.\textsuperscript{17} The implication here is that "all learning is relearning,"\textsuperscript{18} and a process of continuous adjustment.

Chris Argyris of Harvard Business School defines organizational learning as "a process of detecting and correcting error. Error for our purposes is any feature of knowledge or knowing which inhibits learning."\textsuperscript{19} In looking at organizational learning he defines a concept similar to Kolb's model called \textit{single loop learning}. Single loop learning will be explained in further detail in the context of systems thinking in the next chapter. The significant point to be made here about looped learning is that it is a process of continual correction in order to achieve a goal or a target.

\textbf{Barriers to Individual Learning: Conceptual Blocks}

The experiential learning model, while accurately describing the process of individual learning, can be made ineffective by many organizational and individual learning barriers. Many of the individual handicaps to learning occur primarily in the abstract conceptualization stage of the learning model and are referred to as conceptual blocks. James Adams of Stanford University defines conceptual blocks as "mental walls that block the problem solver from correctly \textit{perceiving} a problem and correctly \textit{conceiving} its solution."\textsuperscript{20} In identifying conceptual blocks he argues that "awareness (of conceptual blocks) can not only allow us to better know our strengths and weaknesses, but can give us the motivation and the knowledge necessary to modify or avoid such blocks."\textsuperscript{21}

\begin{thebibliography}{99}
\bibitem{17} David A. Kolb, \textit{Experiential Learning}, p.26.
\bibitem{18} Ibid.
\bibitem{21} Ibid.
\end{thebibliography}
Dealing with Complexity

The real estate developer is expected to synthesize his or her knowledge of numerous essential variables: local supply and demand, macro supply and demand, financing, regulation, construction, leasing, etc.. This is an extremely difficult job to do even if the variables are static. Compound the problem with the actuality that the variables are dynamic and continuously changing and you have a complex dynamic system that is considered beyond human information processing capabilities. The default strategy is often the use of judgment or heuristics.

"The business environment depends so heavily on circumstances, perceptions, anticipatory and competitive behavior, and feedback loops that predictions based on classic verbal logic are likely to be badly wrong. Analysis breaks down when we are dealing with complex systems with many interactive loops. In such systems, you cannot just isolate the parts and put them back together, because in isolating the parts you change the system. The system has to be considered as a whole. So we try to use conceptual models, which are sort of a hypothesis of what is happening. The difficulty is that in a system with...feedback loops, a slight change in the parameters at some point may make the system behave in a totally different way. We have to conclude that human thinking simply cannot cope with complex systems of this sort." [emphasis added]²²

Managers have a need to resolve complexity in their business environment. This need to make sense of uncertainty and complexity results in managers using judgment rules or heuristics to reduce complex mental tasks to simple ones.²³ These heuristics result in perceptual filtering, stereotyping, "mental models" and/or "cognitive biases" that influences the decision making process.²⁴ Some of the biases that effect the business or strategic planning process are:

²⁴Ibid.
Availability: People make decisions based on most recent occurrences or what they remember most. In real estate development this manifests itself in investment analysis that takes only current conditions and projects them forward as many as ten years into the future. Real estate market analysis that takes into consideration only local factors and disregards macroeconomic trends is another example of availability bias.

Hindsight: Knowledge of the occurrence of an event often leads to the belief that it was inevitable. Recent experiences of high office absorption rates lead developers to believe that this is the norm and will continue. They make decisions based on this erroneous hindsight without understanding the underlying causes of that absorption.

Correlation and Causality Judgments: The need for answers or resolution leads one to assume causation where only correlation exists. This is a serious problem as noted by Russell Ackoff:

"Causality is the most important type of relationship involved in problem solving...our ability to solve problems depends critically on how well we conceptualize causal connections between what we do and what we want. Most of our problem solving failures derive from assuming a causal connection where it does not exist or incorrectly characterizing a causal connection where it does exist. Perhaps the most single cause of failure in problem solving derives from incorrectly assuming a causal relationship between variables that have only been demonstrated to be associated."  

27 Ibid., p. 131.
Overconfidence: We often do not realize how little we truly know about how a system operates.\textsuperscript{29} This cognitive bias is very prevalent in real estate where many developers made poor decisions such as building a property where the annual net operating income could not service the debt, but the project was "saved" by inflation at the time project is sold. Japanese investment in real estate is another example of overconfidence, where it was assumed the low interest rates in Japan and the favorable exchange rate between the dollar and the yen would always remain the same.

Desire for Certainty:\textsuperscript{30} A person's cognitive limitations will lead him or her to simplify the process of integrating information when making even the most important decisions. This simplifying process occurred in assembling discounted cash flow models to analyze real estate. These models were comprised of a number of indeterminable variables but they could arrive at an internal rate of return or a net present value that gave developers or investment analysts comfort. It was easy to let this desire for certainty create a belief in numbers that were mostly optimistic guesses.

\textsuperscript{29}J.H. Barnes, \textit{Cognitive Biases and their Impact on Strategic Planning}, Strategic Management Journal, p. 133.
\textsuperscript{30}Ibid.
Organizational Learning

Organizational learning is a term that has come into vogue in recent times. However it has been difficult to define. Some descriptions of institutional or organizational learning from both practitioners and academics follow:

"Organizational learning entails new insights and modified behavior. But it differs from individual learning in several respects. First, organizational learning occurs through shared insights, knowledge and mental models... Second, learning builds on past knowledge and experience---that is, memory."\(^{31}\)

"...institutional learning, which is the process whereby management teams change their shared mental models of their company, their markets and their competitors. For this reason we think of planning as learning and of corporate planning as institutional learning."\(^{32}\)

"This then is the basic meaning of a 'learning organization'--an organization that is continually expanding its capacity to create the future... for a learning organization, 'adaptive learning' must be joined by 'generative learning' that enhances our ability to create."\(^{33}\)

"...learning is the essential capacity if an organization is to engage in systematic change on a continuing basis, and if it is to go beyond the isolated changes and periodic lurching steps observed in so many organizations... the organization that has learned how to learn can preemptively and thus more effectively master... challenges."\(^{34}\)

Knowledge Creation in Organizations

A learning organization, therefore, is not merely one that processes objective information or facts. It goes deeper than that. In Japanese firms some call it knowledge creation. Many of these Japanese firms practice the skills of a learning organization, although they may not refer to it as such. Ikujiro Nonaka, in his Harvard Business

\(^{31}\)Ray Stata, Organizational Learning: The Management Key to Innovation, Sloan Management Review, Spring 1989, p. 64.
Review article, "The Knowledge-Creating Company," shows that many Japanese firms consciously make an effort to expose mental models and perceptions:

"The centerpiece of the Japanese approach is the recognition that creating new knowledge is not simply a matter of 'processing' objective information. Rather it depends on tapping the tacit and often highly subjective insights, intuitions, and hunches of individual employees and making the insights available for testing and use by the company as a whole."35

Nonaka differentiates between the tacit or intuitive knowledge and the explicit or systematic knowledge. In making tacit knowledge explicit (formal and systematic) it can be shared throughout the company. Systems thinking combined with the modeling efforts of system dynamics is a tool for making tacit knowledge or mental models into explicit knowledge or computer models. By forcing managers to rigorously articulate their assumptions or beliefs in order to put them in a system dynamic model, these beliefs are subjected to thorough examination and scrutiny, and are challenged and tested. Nonaka identifies four basic patterns for creating knowledge in any organization:36

1. From tacit to tacit
2. From explicit to explicit
3. From tacit to explicit (articulation)
4. From explicit to tacit (internalization)

Systems thinking’s greatest value lies in the third pattern of converting tacit knowledge to explicit knowledge. But the value of systems thinking does not rest solely at this stage of articulation. The true effectiveness is found at the fourth stage of internalization where the newly formed explicit computer models are then internalized

36^Ibid., p. 98-99.
into the tacit mental models of managers. This is an area of leverage in influencing organizational change because it is these tacit or mental models that effect the behavior of the manager. By moving from explicit to tacit models, management intuition is developed. According to Senge, "(t)he development of management intuition should be the primary objective in the use of system dynamics."37

Organizational Learning Disabilities

Peter Senge identifies in *The Fifth Discipline* what he calls organizational "learning disabilities". The following is a review of some of these disabilities, described in the context of analogous individual learning disabilities and real estate experiences:38

1. *I am my position*: The developer who considers oneself a deal maker or a builder often cannot adapt to declining market conditions. This person is unable to see his or her role in the broader context of the real estate market. The concepts of tenant service and asset management and the fact that real estate itself is a derivative industry can be difficult for the builder to grasp. According to industry consultant Richard C. Shepard:

"A lot of people would like to make the change and don't have the right people to make the change. It isn't easy to just take people who were in development and go into management."39

Harvard Business School professor John Gabarro identified this phenomenon in a comparative study of successful and unsuccessful managerial transitions. Gabarro noted that:

"All other things being equal, prior experience was the single most powerful factor associated with what a new

manager focused on...With very few exceptions, the new manager's actions were in those areas in which he had the greatest prior functional [emphasis added] expertise."40

James Adams identifies several conceptual blocks that can be associated with the developer's narrow view of his or her business within the context of the real estate market. One of these blocks is the perceptual difficulties in isolating problems.41 Often developers can become so absorbed in solving the problem of how to get the project built that they do not question if it should be built. Developers tend to be "action oriented"

According to Adams:

"...difficulty in isolating the problem is often due to the tendency to spend a minimum of effort in problem definition in order to get to the important matter of solving it."42

This action orientation is responsible for many developer's successes.

Unfortunately, often the same skills that lead to a developer's success in getting the project done are the same skills that lead to the developer's misreading of market signals.

"A developer is a unique personality. A developer can stand in a swamp and visualize buildings, sport stadiums, roads, and industrial parks. A developer can convince the state to build roads, convince syndicators to raise capital for some future promised return, and convince otherwise sensible people to relocate their businesses into buildings that cannot yet be seen. A developer will then convince a bank or groups of banks to make construction financing available and resist personally guaranteeing repayment of the loan. Psychiatrists might call such a person narcissistic with delusions of grandeur. In the industry this person is called a real estate developer with a vision."43

2. The illusion of taking charge: This disability is closely related to the previous one. Developers have to overcome significant obstacles to get their projects

42 Ibid., pp. 23.
built. This optimism and "can-do" attitude, while successful from a project perspective, can be their downfall from a long range strategic perspective.

"This same optimism that leads to the success of one project can lead to the failure of another. The strategies used by the developer to protect a project from being killed before it gets off the ground are 'anti-learning' because they close the developer's mind to facts and prevent him from learning."\(^{44}\)

In addition, this action orientation results in an integration of thinking and action that is more aptly described as intuition or instinct. Shoshana Zuboff, references research by Daniel Isenberg, where he found that:

"...top managers think in ways that are highly 'intuitive' and integrated with action. He concluded that the intuitive nature of executive behavior results from the inseparability of their thinking from their actions: 'Since managers often know what is right before they can analyze and explain it, they frequently act first and think later. Thinking is inextricably tied to action...Managers develop thought about their companies not by analyzing a problematic situation and then acting, but by thinking and acting in close concert.'\(^{45}\)

This can be problematic for the real estate developer who, relying on intuition, is unable to associate the results of his or her decisions with the actual decision made, due to the significant time lag between implementation and realization. This action bias is made more problematic when that bias is influenced by flawed perception. Developers, as do most people, make decisions based on perception, not reality. Developers "do not act according to the way things are but according to the way they think things are."\(^{46}\)

Because the developer is acting in accordance with his or her perceptions and has such a strong bias for action, perceptual blocks have a significant impact on the quality of those decisions. An example of a perceptual block is stereotyping, where one sees what one

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expects to see. In some aspects this is considered valuable because it allows one to make quick decisions based on incomplete data. Unfortunately it also causes one to discard information that is in conflict with already established beliefs. Stereotyping comes about because the mind operates as a pattern recognizing system. It sorts out and categorizes information in a structured way based upon likely associations. This is why individuals often ignore, dismiss, or fail to recognize any information that is inconsistent with already established beliefs. One of the valuable insights of systems thinking, to be explained in the next chapter, is that often it is the nature of systems to exhibit counterintuitive behavior in the long run. Without an understanding of system behavior, decisions based on stereotyping or influenced by other perceptual biases are often not just faulty, but actually make the situation worse.

3. The enemy is out there: Developers often fail to see how the cumulative effects of their individual building decisions contributed to the downturn. Their view of the oversupply is a non-systemic, exogenous one. They consider many factors of the development system as outside their control.

"Ask most builders about long term strategy and they'll talk about the next piece of property they want to buy. A feeling of helplessness about the external factors, particularly interest rates and housing demand, is the primary reason that most developers have not bothered with strategic planning."48

4. The fixation on events and inability to understand gradual processes:

"...today the primary threats to our survival, both of our organizations and our societies, come not from sudden events but from slow gradual processes..."49

48Christopher B. Leinberger, Survival of the Fittest, Builder, March 1986, p. 93.
49Peter Senge, The Fifth Discipline, p. 22.
If you put a frog in a pot of boiling water it will immediately try to jump out. If you place the same frog in a pot of room temperature water and bring it to a boil, the frog will gradually boil to death, making no effort to escape. Gradual processes often go unnoticed until it is too late; only crises get acted upon. As developers reflect back on the building boom of the 1980s, the signals of the impending bust may now appear obvious, but they were not at the time. Some developers may have recognized the signals but still did not act.

"...investors are not always swayed by objective evidence--even overwhelming evidence--if it leads to conclusions that contradict their immediate interests as perceived by the 'herd.' Evidence of overbuilding in office and other markets was overwhelming by 1987, and probably even earlier. By 1987, the national office-space vacancy rate--which was under 5% in 1981--had exceeded 19% for three years running. Yet banks accelerated their investments in new construction loans in 1988 and 1989. Even long-term investors continued to buy real estate at rather high prices, although effective rents were falling sharply."\(^{50}\)

The inability of developers to notice gradual processes is further increased by what Edward DeBono calls "the intelligence trap"\(^{51}\) and what Chris Argyris calls "skilled incompetence,"\(^{52}\) where one is so adept at articulating one's point of view and being able to defend that position that he or she is not inclined to actually look for new insights or contradictions to that point of view. Indeed, often line level managers can see signals that a market is changing, but are not motivated to present these findings to higher authority, particularly if it conflicts with upper management's current perception. Often the leasing agents and property managers obtain information that indicates changes in the market conditions that may contradict the decision to go ahead with a development, but for protective reasons, this information will not reach the decision makers.

\(^{50}\)Anthony Downs, *What Have We Learned From the 1980s Experience?,* Salomon Brothers Real Estate Investment Report, July 1991, p. 2.


The developer traditionally has a "project" orientation. Often there is no long
term strategy that takes into account the cyclic nature of real estate, macro and micro
economic factors influencing demand, and the cumulative effects of building. The focus
is on "the numbers" of an individual deal, rather than the underlying economics of the
capital asset. The "deal" orientation of land acquisition, signing the lease, getting the
loan, obtaining the building permit as well as the project management orientation of
schedules, deadlines, breaking ground, topping out, and certificates of occupancy all
contribute to the development mindset of fixating on events.

"The current oversupply of real estate is different from past
cyclical excesses. The present situation is a result of the
commoditization of real estate. Real estate investment
rather than being the result of in-depth understanding of the
dynamics of the industry, has become an in-depth focus on
the numbers. The numerical orientation has replaced
discipline and understanding. The results of this
misdirection will be one of the biggest losses of capital in
the country's history."53

5. The delusion of learning from experience: In David Kolb's experiential
learning cycle, one of the key assumptions is that there is a close relationship between
cause and effect. The amount of time that transpires between when a decision is made
(testing implications of concepts in new situations) and the results of that decision are
recognized (concrete experience) has significant impact on the effectiveness of the
observations and reflections. Combine a significant delay between action and result with
the individual barriers to learning elaborated earlier, and it becomes apparent that
learning from experience should not be considered a "given" condition.

Real estate development is particularly prone to this disability. The delay
between the time a decision to develop is made and the completion, sale, or lease-up of a
project is usually a minimum of three years making it difficult to evaluate the impact of
decisions objectively.

"...the development business is notoriously subject to bad timing and 'always operates six to nine months off.' "54

"Real estate investors usually prepare for the last financial crisis, not the current or the next one. There is a saying that 'The only thing we have learned from experience is that no one learns from experience.' But this saying is false. People do learn from experience--the trouble is, they learn the wrong things. They formulate conclusions based upon recent and/or past conditions without recognizing that changes in these conditions should also change their conclusions. That is partly because it is easier to be certain about what has happened than what will happen."55

Even real estate developers that have a reputation for knowing the market and predicting the real estate slump sometimes failed to learn from their own experience. Chicago based real estate investors Sam Zell and Robert Lurie, who have made a fortune buying up distressed properties during market downturns got caught by the credit crunch. According to Zell, "the challenge of trying to make money in dangerous markets proved irresistible."56 Olympia & York Developments, Ltd. is another example of developers that made their fortunes by buying distressed properties in down markets yet are now facing their own pending insolvency, caused in part by building in an overbuilt market.

6. The myth of the management team: The diverse and conflicting viewpoints of the members of the real estate development firm make it very difficult to reach a consensus on strategic direction. Many development firms are very autocratic.

"In some cases, the owner preferred to maintain control, limiting the extent of the firm's operations to what he could personally direct, or simply working harder within the firm that had grown up around him. Some developers believed

that direct control and responsibility gave them a competitive edge—that banks and other organizations trusted them because they took full personal responsibility. A few respondents admitted to a certain amount of 'necessary confusion' but believed that situation was preferable to becoming over organized, thereby stifling creativity and creating a bureaucratized, territorial structure."

Deal makers may have difficulty embracing a company "retrenching" strategy. [In real estate a typical retrenching strategy is the shift in organizational focus from development to asset management.] Construction managers and project managers are often in conflict.

"One problem was the tension that often occurs between construction managers and project managers: the typical construction manager is 35 to 50 years old with 15 to 30 years of experience, while the typical project manager is 30 years old with two years experience and an MBA. The construction manager is frustrated by how little the project manager knows, and the project manager is annoyed that the construction manager has to show off his knowledge. Another problem was the tension that occurs between brokers, typically happy-go-lucky and late for meetings, and project managers, typically serious and punctual."

The following chapter introduces the concepts and language tools of systems thinking as an organizational framework for problem solving, decision making and creativity. In fact, as James Adams notes, "creativity has sometimes been called the combining of seemingly disparate parts into a functioning and useful whole."

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57 Diane R. Suchman, Managing a Development Company: Interviews with Successful Firms, Urban land Institute, p. 26.
58 Ibid.
3
Systems Thinking

A Systems Perspective

Management science defines a system as "a collection of people, resources, concepts, and procedures that is intended to perform some identifiable function or to serve a goal."\(^{60}\) It is also described as "a set of interdependent elements which act to achieve certain goals and to maintain an orderly set of affairs in exchanges with the environment."\(^{61}\) Jay Forrester, the pioneer of the field of system dynamics refers to a system as "a grouping of parts that operate together for a common purpose."\(^{62}\) The essence of a systems perspective in real estate development problem solving and strategic planning is not that it is a new \textit{theory} but that it is a new \textit{approach}, a different way of viewing an organization and its environment.

Real estate development is a multi-disciplinary field requiring knowledge and expertise in finance, economics, marketing, engineering, design, law, and project management as well as general management. Because of the interrelatedness of these individual elements of the development process, a systems perspective is well suited as a methodology for planning and management in this field.

Traditional management and decision science addresses what are known as "open systems," which are comprised of inputs, processes and outputs.\(^{63}\) The prime characteristic of an open system is the isolation of the output from the input.\(^{64}\) In other words, while the input to the process affects the output, the output does not have any effect on future inputs. [See Figure 3.1]

\(^{63}\) Jack R. Meredith and Efraim Turban, \textit{Fundamentals Of Management Science}, p. 23.
FIGURE 3.1

As shall be shown later, it is this concept of an open system and the corresponding thinking and learning process that follows it, that may be one of the causes of the current oversupply of the commercial office market.

A System Dynamic Perspective

A system dynamic perspective goes one step further than the traditional open system systems perspective of traditional management and decision science. In system dynamics, the management paradigm of a system is that of a "closed loop." The feedback concept is central to the whole system dynamic methodology. Figure 3.1 illustrates that, in a closed loop system, the inputs into the "state" of the system affects the outputs, but then the output feeds back to affect the next input.

FIGURE 3.2

In the system dynamics paradigm, problem solving, strategy, and decision making are not static but are continuous processes. The work is never done. To real estate developers and managers in general this is can be a disquieting concept.

One of the primary difficulties in understanding systems from the system dynamics perspective is linguistics. Classic verbal logic makes it very difficult to describe the structure and behavior of systems. This "linguistic barrier" is one of the intellectual blocks to conceptualization that was identified previously. Systems thinking
and system dynamics have developed both a conceptualization (causal-loop diagrams) and computer modeling (flow diagrams) language that allows systems concepts to move from tacit to explicit.

A primary objective of this thesis is to apply a systems thinking perspective to the real estate development process. In order to do so, the fundamental concepts of systems thinking and system dynamics need to be explained, first generally and then elaborated upon through examples of applications to real estate. The following explanation is only a cursory analysis of the concepts. The reader interested in exploring systems concepts further is advised to study the references contained in the footnotes and bibliography of this document.

**Linear Logic and Circular Logic**

Traditional "linear" thinking or "open loop" thinking may be diagrammed as shown:

**FIGURE 3.3**

```
Access to credit/financing
Regulatory restrictions
The general economy
Oversupply of office space
Barriers to entry
```

Linear thinking looks at the current oversupply of office space and identifies a list of causes. The diagram above shows that the readily availability of financing is one cause of the oversupply. Reduced regulatory restrictions are another. A boom economy and low barriers to entry are also causes of overbuilding. This is linear thinking.
Systems thinking identifies circles of causality or feedback rather than straight lines. For example:

**FIGURE 3.4**

Easy access to credit may result in an increase in the supply of office space, but when there is an oversupply the result is a "credit crunch." This is circular logic, where A affects B but the change in the state of B feeds back to affect A. Easing of regulatory restrictions is often done to stimulate building, but once overbuilding becomes a concern regulatory restrictions become more severe.65 This same feedback logic may be applied to the general economy affecting real estate and real estate (overbuilding, savings and loan crisis, etc.) affecting the general economy. Barriers to entry usually are minimal during a boom, which leads to oversupply, which in turn feeds back to create stronger barriers to entry.

The field of system dynamics recognizes four hierarchical levels of feedback system structure--variables, links, feedback loops, and feedback systems.66

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**Variable:** A variable is any quantity that changes over time. This can be total office space, new construction, building scrap rate, demand for space, etc.

**Link (or linkage):** The cause and effect relationship between two variables. Figure 3.5 illustrates:

**FIGURE 3.5**

```
new construction  +  total office space
(variable)         (variable)
```

Links will be described in greater detail later in this chapter.

**Feedback Loop:** A feedback loop exists when two or more loops are connected in such a way that starting from any variable one can follow the loop around and return back to that variable. Figure 3.6 illustrates:

**FIGURE 3.6**

```
feedback loop
```

**Feedback System:** A feedback system is a combination of feedback loops interacting together. It is this aspect of interacting multiple feedback loops that creates the dynamic complexity of systems.
Feedback Loops

The feedback loop is the basic structural element within a system. Feedback as indicated earlier is a "closed loop structure that brings results from past action of the system back to control future actions."\(^{67}\) A feedback system controls action based on results from previous action as illustrated in Figure 3.7. It occurs when one [a manager] takes action that is later influenced by the results of that action.\(^{68}\)

FIGURE 3.7

Systems thinking involves three basic shifts from traditional management thinking\(^{69}\):

(1) Shift from straight line to circular cause/effect relationships; i.e. feedback

(2) Shift from an externally oriented to an internally oriented locus of responsibility for performance.

"...the system dynamics approach tends to look within a system for the sources of its problem behavior. Problems are not seen as being caused by external agents outside the system."\(^{70}\)

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(3) Shift from an abstract to a more operational view of how things work.

The Language of System Dynamics

The first and most conceptual stage of applying system dynamics is the application of a tool called causal-loop diagramming. "Causal-loop diagrams identify the principal feedback loops. Causal-loop diagrams play two important roles in system dynamic studies. First, during model development, they serve as preliminary sketches of causal hypotheses. Second, causal loop diagrams can simplify the illustration of a model."\textsuperscript{71} The second and more explicit stage of system dynamics is the use of flow diagrams. Flow diagrams are more representative of the actual structure of the system. I will first present a visual description of a causal-loop diagram, followed by examples of two fundamental feedback loops that exist in all dynamic system structures---negative or positive feedback loops. The concepts of flow diagramming and modeling will be illustrated in the final chapter of the thesis where the flow diagram of a real estate development system for commercial office space is used. Causal loop diagramming provides a language to illustrate the three basic aspects of system dynamics: balancing processes, reinforcing process, and delays.

Causal-loop Diagramming

The first step to understand causal-loops is understanding how to describe the relationships between two variables, known as causal-links. For example, in Figure 3.8:

FIGURE 3.8

In this example, the arrow designates the direction of influence and the sign (plus or minus) indicates the type of influence.\textsuperscript{72} In this case an increase in business migration to a region increases the demand for office space in that region. This indicates a positive relationship. Figure 3.9 indicates a positive link:

FIGURE 3.9

"A causal link from A to B is positive if (1) A adds to B or (2) a change in A produces a change in B in the same direction"\textsuperscript{73}. Figure 3.10 shows a negative link:

FIGURE 3.10

"A causal link from A to B is negative if (1) A subtracts from B or (2) a change in A produces a change in B in the opposite direction."\textsuperscript{74}

\textsuperscript{72}Michael R. Goodman, Study Notes in System Dynamics, p. 7.
\textsuperscript{73}George P. Richardson and Alexander L. Pugh III, Introduction to System Dynamics Modeling with Dynamo, p. 26.
\textsuperscript{74}Ibid.
A **causal-loop** is formed by the closed series of a number of causal links. The cumulative effects of the individual links in a loop denotes the **character** of the loop (either positive or negative).\(^75\) For example:

FIGURE 3.11

If the demand for office space (defined here as the need for space that is not currently available in the region) increases, then the construction of office space will increase (positive link). An increase in the construction of office space increases the supply of office space (positive link); and an increase in the supply of office space decreases the demand for office space (negative link). The net result is that an *increase* in demand for office space sets into action a circular chain of events resulting in a *decrease* in the same demand, back to a desired "equilibrium" level. Therefore, this is a self regulating, balancing process or a **negative feedback loop**.

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\(^75\)Michael R. Goodman, *Study Notes in System Dynamics*, p. 27.
Balancing Processes--The Negative Feedback Loop

The generic form of a negative feedback loop looks like this:

**FIGURE 3.12**

"A condition is compared to a target condition or a goal. Any discrepancy which may occur between the two stimulates an action. The action returns to move the condition closer to the target--thereby eliminating the discrepancy."\(^{76}\) As can be seen from this generic example, negative feedback loops negate change, they are goal seeking and self corrective. Negative feedback loops are the components of system structure that are cause oscillation or fluctuation and instability.\(^{77}\)

A thermostat controlled heating system is an excellent physical example of the negative feedback loop:\(^{78}\)

**FIGURE 3.13**

Assuming that the desired room temperature is constant, an increase in the temperature

difference between the desired room temperature and the actual room temperature cause an increase in the heating (positive link); an increase in the heating causes the actual room temperature to increase (positive link) until the room temperature reaches the desired level (the temperature difference equals 0 degrees). This physical example shows the self-regulatory nature of negative feedback systems. In biological processes this self regulation is called homeostasis and in economics this is referred to as equilibrium. As will be shown later in this chapter, the underlying structure of the real estate development industry is a negative feedback loops with a delay.

It is appropriate at this stage to recall the Kolb experiential learning model and Chris Argyris' concept of single loop learning. With a rudimentary understanding of systems thinking theory, one can identify that these models of learning are negative or balancing processes. Argyris utilizes the thermostat analogy to explain his single loop learning concept. The balancing process of turning the heat off and on to reach a desired temperature is identified as single loop learning and is considered analogous to an organization or its individual members carrying out existing policies to achieve predetermined objectives. Jay Forrester of Massachusetts Institute of Technology also considers single loop learning to be the most common method by which people gain intuition from experience:

"Most of our intuitive responses have been developed in the context of what are called first order, negative feedback loops. Such a loop is goal seeking and has only one important state variable. For example, warming ones hands beside a stove can be approximated as a first order, negative feedback loop in which the purpose of the process is to obtain warmth without burning one's hands. The principle state variable of the loop is the distance from the stove. If one is too close he burns his hands, if too far away he receives little heat. The intuitive lesson is that cause and effect are closely related in time and space."  

Argyris goes a step further and identifies a more comprehensive form of learning called *double loop learning*. Again using the thermostat analogy he contends that "if the thermostat could question itself about whether it should be set at 68 degrees, it would be capable of not only detecting error but of questioning the underlying policies and goals as well as its own programs. This is a second and more comprehensive type of inquiry, hence it might be called double loop learning."\(^{81}\)

In the real estate industry, many successful developers are those that are adept at single loop learning. They are purposeful, task oriented, and goal focused. Developers need to be this way to overcome the numerous obstacles that impede the success of their projects. The processes of land acquisition, obtaining financing, overcoming regulatory hurdles and simply getting the project built are single loop learning or reinforcing loop processes.

Double loop learning is where the developer stops and asks whether or not the project should even be pursued. It is more reflective, but not in the immediate assimilative sense that reflection is a part of Kolb's learning loop. In Kolb's learning loop there is relatively minimal time between cause and effect which facilitates accurate reflection; burning one's hand on a stove allows one to quickly develop a theory as to the cause of the pain. In real estate development, the delay is *years* between cause and effect. Hence the need for institutionalized double loop learning where an environment is created that allows for reflection on long term consequences of decisions made in the present. My hypothesis is that developer's are weak in this area. This weakness should be evident in developers' approaches to market analysis, their decision models, and their judgment, all which make up their mental models.

Reinforcing Processes—Positive Feedback Loops

Positive feedback loops are reinforcing processes. They are the feedback structure found in the behaviors of growth, decay, or collapse. Many current phrases implicitly express the concept of positive feedback such as vicious circles, snowball effect, jumping on the bandwagon, etc. In a positive feedback loop a variable continually feeds back on itself in the same direction. Population growth and compounding interest are examples of positive feedback:

FIGURE 3.14

At a constant birth rate, as population increases the number of annual births will increase, further increasing the population; this increased population results in an even larger number of annual births, again further increasing the population, and on and on in a spiraling rate of growth. Because of the difficulty in expressing this process verbally, a different type of language, such as causal loop diagramming, is necessary to more clearly explain these types of processes. Positive feedback loops are the structures of exponential growth. Compounding interest is another example:

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82Michael R. Goodman, Study Notes in System Dynamics, p. 15.
At a constant interest rate, annual interest increases the bank balance. This increased bank balance results in even more interest accruing the following year, further increasing the bank balance. This is a reinforcing process resulting in exponential growth of the bank balance [provided there are no withdrawals].

**Limits**

In all examples of growth, the system behavior will ultimately run into physical or psychological limits. For example, population growth will ultimately be slowed by the capacity of the earth's resources to sustain the total population. This is a physical limit. A municipality cannot allow more real estate development than can be supported by infrastructure. This is also a physical limit.

Psychological limits are often seen in the dynamics of speculation. In the better known speculative binges in history—the Tulip Bulb Craze in Holland, the South Sea Bubble in England, and the Florida Real Estate Boom of the 1920s—market prices finally reached a limit where investors no longer were willing to buy, thereby stopping and usually reversing the reinforcing loop of speculation. The reinforcing loop of speculation can be depicted as follows:

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Delays

Reinforcing processes and balancing processes are two of the fundamental building blocks of system dynamics. The third is delays. Delays are a significant cause of the inability of a manager to learn from personal experience as effectively as he or she could. As stated previously, looped learning is most effective when the feedback is immediate. Forrester describes the difficulties that delays cause in attempting to understand how a system operates:

"...in complex systems cause and effect are not closely related in either time or space. [emphasis added] The structure of a complex system is not a simple feedback loop where one system state dominates the behavior. The complex system has a multiplicity of interacting feedback loops....The high degree of time correlation between variables in complex systems can lead us to make cause and effect associations between variables that are simply moving together as part of the total dynamic behavior of the system. Conditioned by our training in simple systems, we apply the same intuition to complex systems and are led into error. As a result we treat symptoms, not causes. The outcome lies between ineffective and detrimental. The failure of intuition has often been found in the corporate setting by the process of building a simulation model of the policy structure of an organization."

Delays in the real estate development system are a significant structural cause of the boom and bust cycle in the industry. Most significant is the delay between the time a project is started until the time it is completed and/or leased up. As is evident from the

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over built commercial office market, the market demand for office space can change drastically from the time that the decision is made to initiate a project and when that project is completed.

This structural delay cannot be eliminated—it may be reduced somewhat, but due to trends in regulatory approval processes it will most likely become longer. Pre-leasing of space prior to construction, in lieu of speculative building, mitigates the market risk due to this delay to a great extent, but tenants that are both willing and able to make location decisions 3 to 7 years in advance may be rare. *This delay in the feedback process is one of the prime structural reasons for the cyclicality of the real estate industry.*

Real estate markets are subject to distortions because of this physical time delay factor. In addition to physical delays, there are also delays in information or response to the market. George Stalk of the Boston Consulting Group, looked at traditional manufacturing industries and identified time efficiency or improvement (i.e. elimination of delays) as *the* next source of competitive advantage for firms:

"What distorts the system so badly is time—the lengthy delay between the event that creates the new demand and the time when the factory [developer] receives the information. The longer the delay the more distorted is the view of the market. Those distortions reverberate throughout the system producing disruption, waste and inefficiency."\(^{85}\)

Unfortunately, while it is realistic to improve on the delays in receiving information on the market, it is not foreseeable that the physical time delay component of the construction lag will be significantly reduced, particularly in the commercial office market. Residential developers can somewhat adopt Stalk's philosophy by phasing their development projects. In commercial real estate, the developer does not have this luxury.

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and must, therefore, compensate by obtaining a better understanding of the market dynamics.

**Real Estate Development System Structure**

In a study by Wheaton/Torto-Coldwell Banker\(^{36}\) it is noted that during the boom periods of 1970-1975 and the more recent 1980-1987, construction completions were 50% greater than net absorption of office space, resulting in vacancies of 14% in the 70s and 18% in the 1980s. The increase in vacancy during the latter cycle appears to be a result of the longer duration of the overbuilding phase.

Wheaton and Torto also identify two underlying trends in the office market that have occurred since World War II: an 8 to 10 year cycle and overall long run growth.\(^{37}\) The overall long run growth is depicted in Figure 3.17.

**FIGURE 3.17**

**ANNUAL GROWTH OF OFFICE EMPLOYMENT**

<table>
<thead>
<tr>
<th>Period</th>
<th>Per Annum Growth %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1955-59</td>
<td>3.4</td>
</tr>
<tr>
<td>1960-64</td>
<td>3.0</td>
</tr>
<tr>
<td>1965-70</td>
<td>5.4</td>
</tr>
<tr>
<td>1971-75</td>
<td>3.5</td>
</tr>
<tr>
<td>1976-81</td>
<td>5.5</td>
</tr>
</tbody>
</table>

Why, with a long term growth trend in office employment, does the real estate development industry continue to exhibit the boom and bust cycle characterized by overbuilding and high office vacancies? One explanation is that it is the nature of the

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internal dynamic structure of the industry, particularly the supply side reaction.

According to Wheaton and Torto:

"...the industry itself creates the cycle, largely though its inability to forecast correctly. Without reliable forecasts, developers bring into motion the wheels of supply only when market conditions are favorable. Extrapolating favorable conditions into the future, the industry as a whole continues building. When the space actually becomes available several years down the road, the market naturally softens as the supply is slowly absorbed. The downturn causes the industry to postpone construction plans for a while, but this only creates a tight market in the future---which starts the cycle once again. The cycle is caused then, by the use of current market conditions as a barometer for the future, rather than being able to forecast both demand and the likely response of the industry."\(^88\)

The causal loop diagram depicting the fundamental internal structure of the real estate development industry is as follows:

FIGURE 3.18

The feedback structure also includes a component of investor demand. This is distinct from the demand for space. Investment demand is more speculative. In the recent past, financial institutions were placing investors' money in real estate to capture the "inherent appreciation"\(^89\) due to inflation and or speculative demand. This is the


\(^{89}\)Todd S. Schubert, Publicly Traded Real Estate and the Myth of Inherent Appreciation, Real Estate Review, Fall 1990, pp. 53-68.
"Greater Fool" theory or "Castles in the Air" theory described by Princeton economist, Burton Malkiel. What occurred in the real estate industry is analogous to the stock market where two methods of valuing stock are utilized. The first is the "firm foundation" method where a stock is valued based on its "intrinsic value" which is determined by rigorous analysis of present conditions and future prospects. For real estate, the present conditions would be the income component of valuation based on rents, and the future prospects is the residual component based on inflation. The second method of valuation is based on psychological value of the stock. The stock is valued based on the expectations of how people will behave. According to Malkiel,

"In this kind of world, there is a sucker born every minute ---and he exists to buy your investments at a higher price than you paid for them. Any price will do as long as others may be willing to pay more. There is no reason only mass psychology. All a smart investor has to do is beat the gun ---get in at the very beginning. This theory may be less charitably called the 'greater-fool' theory. It's perfectly all right to pay three times what something is worth as long as later on you can find some innocent to pay five times what it's worth."91

Anthony Downs, Senior Fellow at the Brookings Institution in Washington D.C., also identifies the "irrational buyer" as another aspect that fuels speculative investment, by sending the wrong signals to the marketplace:

"...the 'irrational' buyer (or buyers) whose strong desire to own a particular property leads him to pay much more than the value calculated through standardized procedures...is a person whose valuation of a property includes a premium above its comparative 'purely economic earning power,' because of some specific personal appeal the property has for the buyer's ego or personal desires."92

90Burton G. Malkiel, A Random Walk Down Wall Street, pp. 30-32.
91Ibid., pp. 31-32.
This type of speculation is particularly risky with an illiquid product such as real estate, where you cannot simply cut your losses and get out. Real estate is a capital good and as such is particularly sensitive to economic fluctuations.\textsuperscript{93} Even depending on the future prospects of inflation is somewhat speculative, as the intrinsic value of real estate can only be assured by the demand for office space, this demand being primarily a function of growth in office employment.\textsuperscript{94} The speculative method of valuing real estate was further exacerbated by "too many dollars chasing too few properties."\textsuperscript{95} In 1985, the supply situation could be described as follows:

"For real estate developers in today's financial marketplace, every business day means another chance to win. Developers are being overwhelmed with offers of construction money, partnership equity, and presale packages from lending institutions, money brokers, and syndicators. Building for tenants has given way to building for money. [emphasis added]...investor supply rather than user demand is largely responsible for the ongoing construction boom that is changing cityscapes and countrysides...nothing seems to make much sense. Prices and vacancies are at all time highs, yet the construction crane continues to dominate urban and (now) suburban skylines, and investor demand seems insatiable."\textsuperscript{96}

Five primary reasons for the oversupply of investment funds have been identified\textsuperscript{97}:

(1) Inflation and market conditions.
(2) Deregulation of financial services.
(3) A national market.
(4) Overly optimistic outlook.
(5) Foreign investment.

\textsuperscript{97}Ibid., p. 8.
This oversupply of funds can exacerbate the developer’s perceptual blocks and impair his or her ability to pay attention to the fundamentals of real estate user demand. As far back as 1984, Sam Zell was cautioning:

"The economic viability of the development process is dramatically different when the developer is in the role of being the creator of the product to be sold as opposed to the creator of the product for long term ownership and management...the creation of new real estate projects and the financing thereof do not include any presupposition of need. Developers are creating a product that meets the developer’s test of profitability, not necessarily the marketplace’s test of economic viability. If the developer believes the creation and sale of a product assure him a profit, then the discipline of the marketplace disappears and oversupply follows."\(^98\)

The irrationality of this type of development decision is highlighted by a prominent developer’s comments in the December, 1986 issue of Urban Land:

"I think there will be a continuing opportunity for the developer / entrepreneur. To me it’s based on the supply and demand of money. Real estate requires a lot of money, and if a lot of money is available, whoever has the money will seek the entrepreneur with the best success record. If there’s not a of money available, the entrepreneur will seek the most likely source of it. So it goes in cycles."\(^99\)

The structure of this speculative pressure and/or the effects of financing on the number of construction starts is a reinforcing loop, as indicated in Figure 3.19:

**FIGURE 3.19**

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Capital is initially attracted to real estate because of the favorable returns relative to other investment alternatives. As more capital flows into real estate, cap rates are driven down, thereby driving prices up\(^{100}\) confirming the investors' original expectations and attracting more investment funds to real estate based on expectations for a continuing rise in price. [It is emphasized here that this demand for buildings is distinct from the demand for space.] It should be noted that reinforcing loops can have effects in the opposite direction once the original loop dominance is overcome or halted by psychological "limits" as mentioned previously. In residential real estate, speculation will usually bump up against a limit of housing affordability. In commercial real estate the limit occurs at some point where the rents are unable, even with anticipated increases, to justify the capitalized value of the property. This reversal of the reinforcing loop is most evident in the current "credit crunch" where the banks, savings and loans, and institutional investors have adopted the "herd" mentality and are steering clear of real estate investments. Many investors see the redirection of this reinforcing loop as exacerbating or being the sole source of their real estate problems:

"What I did not see was the destruction of the banking system...whatever problems we have gone through have not been problems of empty buildings or inadequate collateral but problems generated by the elimination of financing in the real estate industry...at banks, real estate has become the 'R' word."\(^{101}\)

The difficulty in learning from experience in the real estate development industry may be compounded by the length of the cycles which can be from 8 to 10 years.\(^{102}\) Many of the people in decision making positions in investment and development firms have not fully experienced the cycles. A study in the mid-1980s surveyed acquisition specialists that "do the deals" or make real estate purchases for development decisions for

\(^{100}\)Richard Hopper, *A Model for Targeting Real Estate Investment Opportunities*, *Real Estate Finance Journal*, Fall 1990, p. 44.


financial institutions. The survey found that 90% of the acquisition specialists have between two to five years experience, 90% of them are under the age of 40, and 62% are between the ages of 25 and 35.\textsuperscript{103} In other words, it would be most difficult for these real estate decision makers to learn from experience because they have not experienced a complete cycle.

Combining the balancing loop of the real estate development process with the reinforcing loop of speculative demand,\textsuperscript{104} we have a simplified causal loop diagram example of the dynamic structure of the real estate development process:

FIGURE 3.20

The construction of office buildings increases as the price for the structures goes up, whether or not this price is caused by user demand for space or investor demand for buildings. The construction of new buildings will continue as long as the price signal


\textsuperscript{104}Richard Hopper, \textit{A Model for Targeting Real Estate Investment Opportunities}, \textit{Real Estate Finance Journal}, Fall 1990, p. 44.
justifies it. After a substantial delay from the time the development decision is made and construction is completed, the supply of office space is increased tending to reduce the price. The delay in the balancing adjustment of the price signal results in the overbuilt conditions.

This diagram can be made more complex depending on the amount of detail one desires to include in system analysis. Another balancing loop could include regulatory restrictions on the supply of office space. Many of the variables shown here can be disaggregated into smaller components by product type, user type, and even investment institutions. Commercial office demand, for example, can be analyzed on both a macroeconomic level and on a microeconomic or locational level, separated by different types of users such as law firms, insurance companies, etc. The level of detail is not the focus of this thesis, however. The main point to be understood is that this simple system structure creates the cyclical behavior of the real estate market. Yet even at this rudimentary level of detail, the combined effects of the various system variables would appear to be difficult to intuit. It is the dynamic complexity, not the detail complexity, that creates conceptual blocks to learning about the cycles and learning from experience. According to Senge:

"Some types of complexity are more important strategically than others. Detail complexity arises when there are many variables. Dynamic complexity arises when cause and effect are distant in time and space, and when the consequences over time of interventions are subtle and not obvious to participants in the system. The leverage in most management situations lies in understanding dynamic complexity not detail complexity."\textsuperscript{105}

The following chapter provides a synthesis of the field interviews of real estate development professionals actively involved in making the decision to develop. The purpose of the interviews is to establish the mental models of these professionals,

learning disabilities that impair these mental models, and to ascertain their level of systemic understanding of the real estate development industry.
Field Research and Analysis

This chapter provides an analysis of field research. The research comprised of personal interviews with the executives of real estate development firms who are involved in their companies' decision to develop.

Selection of Research Sites

The selection of the research sites for field study was based on the following criteria:

(1) The individuals interviewed are executives in real estate firms. These individuals are specifically involved in the decision to develop for their respective firms. One individual in each of five real estate development firms were interviewed.

(2) The real estate development firms studied are national or regional leaders in the development profession. This characteristic of the development firms is believed to adequately compensate for the small sample size, due to the large number of transactions enacted by the firms. The objective of the interviews is to analyze the decision to develop and determine the mental models of the decision makers. Numerous transactions resulted in more decision experiences from which these developers were able to establish their mental models.

(3) The firms are from different geographic regions of the United States as are the actual developments reviewed. Two are from the San Francisco Bay Area, two are from Los Angeles, one from Washington D.C., and one from Orange County, California.

(4) The selection of real estate development firms was not product specific. Some were office developers, some were involved in residential,
industrial or retail development. Regardless of product type, all the developers were subject to boom and bust cycles.

(5) In the course of the research, the developers uniformly identified the supply of funds as being an important factor influencing the decision to develop. Because of this finding, an additional site was selected—a real estate advisory firm to institutional investors. This site will be specifically identified as ADVISOR 1.

Other characteristics of the sites should be noted. Several of the individuals interviewed were known to this author prior to the research effort. It is believed that this facilitated more candid responses rather than bias the results. The individuals interviewed also requested confidentiality in return for their openness. This confidentiality is being honored and the frankness of the responses are self evident.

An interesting fact came up in the course of the interviews: most of the individuals interviewed had prior experience in real estate working for banks, insurance companies, and consulting firms. While their broad range of experience was not anticipated, it provided useful insights, particularly when analyzing the financial component of the market structure.

Interview Methodology

The interviews were conducted both face-to-face and by telephone. Average length of time for the interviews was approximately two hours. The format of the interviews was very informal and non-structured in order do draw out the individuals' mental models, uninfluenced by this author's own bias. The objective was to determine how developers used both experience and analytic tools in arriving at the development decision. It is the combination of these factors that form the developers' mental models, and it is mental models that are the basis for their decision making.
Mental models are "deeply held internal images of how the world works, images that limit us to familiar ways of thinking and acting."\textsuperscript{106} While these mental models may be simple generalizations or complex theories, the most important aspect of these models is that \textit{influence how one acts}.\textsuperscript{107} The field interviews therefore are necessary to determine the mental models of real estate developers that influences their actions. Discounted cash flow models and econometric or statistical models can provide useful data and insights but unless they can become a part of an individual's mental model, they are merely academic. As Senge observes, "the inertia of deeply entrenched mental models can overwhelm even the best systemic insights."\textsuperscript{108}

The basic framework for the questions used in the interviews is depicted in Figure 4.1 below:

\textbf{FIGURE 4.1}

\begin{figure}[h]
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\end{figure}

\textsuperscript{106}Peter M. Senge, \textit{The Fifth Discipline}, p. 174.
\textsuperscript{107}Ibid., p. 175.
\textsuperscript{108}Ibid., p. 178.
The individual and organizational obstacles to learning and the systems thinking concepts established in the previous chapters will be used as a background within which to analyze the formation of real estate developer's mental models. The data from the field research will be organized and presented within the six category framework shown in Figure 4.1. This framework was employed because (1) it is specific to the real estate development process and intimately familiar to the real estate executives interviewed, and (2) it provided a means to obtain insights into developers' mental models that could not be obtained by asking them directly and possibly biasing their response. The insights that the interviews were intended to elicit are:

1. Developers' level of systemic understanding of the real estate development industry.
2. Real estate developers' internal vs. external orientation.
3. The relative use of intuition vs. analytical methods in development decisions.
4. Length of the real estate developers' time horizons: short term vs. long term.
5. Identification of conceptual blocks that influence the formation of developers' mental models

Description of Research Sites:

DEVELOPER 1: The individual interviewed is the Senior Vice President and Chief Administrative Officer for a commercial real estate development company located in Los Angeles, California. In addition to development, the firm has in-house leasing and property management services. This individual formerly worked as a real estate investment analyst at a large insurance company.

DEVELOPER 2: The individual interviewed is the Vice President of Finance for a large apartment and commercial office developer in San Francisco, California. The company's primary focus is apartment buildings and commercial development is secondary. The
individual interviewed has prior experience as a real estate loan officer at a major California bank.

DEVELOPER 3: The individual interviewed is a regional manager for the Northern California office of one of the largest commercial, retail, and industrial development companies in the United States. This individual had prior experience working for a management consulting firm.

DEVELOPER 4: The individual interviewed is a vice president of a residential and commercial property developer located in Orange County, California. Most of the firm's work is focused in the Southern California region, but some developments are pursued in other geographic regions.

DEVELOPER 5: The individual interviewed is the Director of Research for a commercial property developer located in Washington D.C. It is significant to note that this is the only firm that had a specific position devoted entirely to market research.

ADVISOR 1: The individual interviewed is the Senior Vice President of the Los Angeles office of one of the largest real estate advisory firms in the United States. The company provides real estate advisory services to pension funds, foreign investors, insurance companies, and other institutional investors, as well as real estate developers.

Synthesis of Field Research within Framework

1. Development Strategy

The developers interviewed all showed a predilection towards overemphasis of their understanding of the local markets in development decision making. The more
detailed knowledge of the local economic variables, the greater the level of confidence in their judgment.

Our company line is that 'a building is a foundation of knowledge in which to make an investment decision.' We profess to look at:

- local economic conditions
- depth of the market
- nuances of location
- local political climate and connections
- expected client(s)
- anticipated demand
- proper project size and design criteria
- government structure and approvals required
- community perception of growth and sources of future competition

We seek properties that can claim a 'franchise' in its respective market. In other words you are the only guy in town. It's like finding a place with growth controls where you can get in, so then you have a scarce commodity. [DEVELOPER 1]

Our strategy has been to buy slightly depressed properties and create value. We also try to stay within San Francisco because we know it. We know the politics, we know the architects, engineers, consultants and subcontractors. We don't like to be "pioneers" in other areas. [DEVELOPER 2]

We tried to look for trends in Southern California and pursue these. Our general strategy was to find financial investors and combine their money with our expertise. For example, three years ago one of these trends was the master planned community. We looked at a piece of property, created a 100 acre redevelopment area near the airport and began market analysis. In assembling land and negotiating agreements with the communities we try to find a niche within what we do best. Our biggest strength is our knowledge of the political approval process. [DEVELOPER 4]

All of these responses are examples of localized, linear form of understanding of the real estate market. Comfort is derived from intimate knowledge of the product type, the political process, local demand, etc. This is reflected in their statements of development strategy. This understanding of the local market, while necessary, is only an understanding of the detail complexity of the real estate marketplace. The confidence gained by possessing this detailed knowledge obscures from the developer his or her lack of understanding of the dynamic complexity. Overconfidence in knowledge of the
details allows one to neglect a broader perspective of the market. This is evidenced in one developer's surprise:

We don't really have a formal development strategy. However, we did go through a formal business planning process in the spring of 1990. We were asking ourselves, "What business are we in, what are the changing demographics, what is the supply and demand situation?" At this point more than any other did we look at things in more big picture way. But prior to that we never did. Just the exercise of putting together a business plan can help you understand the market better.

*In retrospect, even as recently as 1990, we had no idea just how bad it was. Nobody appreciated how much the capital markets were changing. It was like one day everything was fine and the next day the lights went out, the money just stopped.* [emphasis added] [DEVELOPER 3]

This focus on the locational aspects of supply and demand is also indicative of the perceptual biases of a desire for certainty, which leads one to simplify the process of integrating information, and availability bias where one makes decisions based on the availability of information or what he or she knows best.

2. Investment Decision Models

In making the decision to develop, a common tool used in assessing the investment is the discounted cash flow model. The model itself is only as good as the assumptions that are placed in it. Discounted cash flow models require the development investment analyst to make projections about the future, traditionally for a minimum of ten years. Invariably these projections are optimistic. The mental models of the developers interviewed held that present conditions would remain the same or improve far into the future. Hindsight indicates that this optimism was irrational. Yet most development decisions were made under these assumptions.

In the past we used to use your standard pro forma with an ten year discounted cash flow model and calculate a net present value based on the stream of cash flows and a reversion at the end. Because of the obvious flaws in that we now look at the cash on cash yield on the first year's
stabilized income. We use a 10 1/2% hurdle rate and don't rely on the reversion. [DEVELOPER 3]

We used to use a flat 5% vacancy rate in our pro formas but now we are changing that because sublet space is changing the structural vacancy rate. [DEVELOPER 5]

There was no logic to the DCF [discounted cash flow] analysis. It never had a true reflection of the costs. The best way to analyze the deal is by asking "When do we break even?" In other words you need to have NOI [net operating income] equal to the debt service. You also need to figure cost increases as well as the capital costs of maintaining the building and keeping tenants. These usually were not included in pro formas. [DEVELOPER 4]

Often the pro forma or discounted cash flow model was used to justify a predetermined decision. Because of both the internal and external pressures to "do the deal" the DCF model would be adjusted to yield the appropriate return that investors or lenders desired to see. Much of this "tweaking of the numbers" required a heavy reliance on the reversion component [sale price] of the model.

In DCF analysis, one rule of thumb was that we never wanted to get in a position where the residual component was 50% of the valuation. Unfortunately, we broke this rule a few times. You know how it is--- the market was the market at the time--you "gotta" have the building. [ADVISOR 1]

Availability bias was again evident in the judgment of all interviewed as current conditions, i.e., cap rates, were used to predict the reversion value of the development project ten years later. Present cash flows were expected to remain the same or improve.

If I could build a building at a cost that would generate a 10% cash flow, with 8% or less cap rates at the time, we would do the deal. You could be a merchant builder, get it partially leased up. Because there was so much competition to do deals you really began relying on the DCF [discounted cash flow] model--and especially relying too much on the reversion component. Then we all started running into problems with cash flow because of rent concessions. The cash on cash return was 7 1/2% and the money cost 8 1/2 %. When the 6% cap buyers left the market, we got burned. We were relying on them to save our deals. It caught to be so competitive to make deals that you would be [showing] leveling operating expenses, use a 10% IRR [internal rate of return], and push the income
growth and reversion components of the DCF.
[DEVELOPER 1]

Often the income component of the model was assumed to increase annually. The assumption of appreciation of the income was based on judgment, rather than analytical reasoning. There was no historical data to support this reasoning. Often the projections were done to satisfy the lenders or investors and obtain financing.

Either we created value to improve the leases or we just relied on the marketplace. Mostly we believed that three years down the line we would benefit from appreciation.
[DEVELOPER 1]

The problem is even with this conservative method of determining cap rates, which isn't always used--9 times out of 10 the developer just goes by a comparable approach--there is plenty of room for error. Instead of capping today's income they trend rents upward period by period. For example, the pro forma would show 4% annual revenue increase and a 3% annual expense increase. Think about it--those lines never intersect! That pro forma and a couple of glossy pictures and the bank gives them the loan!
[DEVELOPER 2]

The conclusion can be made that discounted cash flow models were both misunderstood and abused in assessing the decision to develop, some cases more than others. The discounted cash flow models were only as good as the underlying assumptions. Spreadsheets that were used in preparing these models did not require any explanation of the causal relationship between variables. For example, a 4% annual income increase assumption was not tested against the conditions that were required to cause this to be true, such as increasing office employment growth, controlled supply, etc.. Discounted cash flow models used in this manner were a non-systemic way of viewing the development decision. But it was commonplace. These models were used to justify preconceived decisions, obtaining financing, and often erroneously provided a degree of comfort to those making the decisions.
3. Real Estate Cycles

Questioning developers about real estate cycles clearly indicated that their mental models (1) were not systemic and (2) had an external or exogenous orientation. All interviewed were unable to articulate an explicit understanding of the cyclical behavior of the real estate market being caused by the internal structure of the system, specifically the supply side response to external demand. One developer's external orientation became evident when he assumed that stable, positive economic growth meant that they should not consider cycles.

We never looked at cycles. Our analysis figured stable, positive economic growth. In-depth market analysis was not done for decision making, it was done to obtain financing. We had to show that the market had enough depth that there was sufficient liquidity for the investor. Frankly, during that period of time you were concerned about getting the deal done and didn't really care about cycles—it was all ego and pressure to do the deal. [DEVELOPER 1]

For some, the cyclicality was acknowledged but not made explicit. Understanding of the cycles was intuitive.

Right now we are just doing five year lease deals because we think the market is going to turn up in five years. What do we base this on? I don't really know, nothing analytical, just by talking to other people in the business one gets a sense of where the market is going. Sort of trending historical absorption. I don't think we have seen the bottom of the market yet. It's not very scientific. Most people around here see it being 1997 before things turn around. We don't consciously pay attention to cycles—more intuitively. We look at the more micro aspects of the market. [DEVELOPER 2]

I'd say we looked at cycles in a qualitative, subjective kind of way. We did not do any empirical analysis of cycles or try to measure the length of the real estate cycles. [DEVELOPER 3]

Another developer believed that analysis of cycles might not be beneficial because of the risk involved in trying to time them. This again illustrates an external or exogenous orientation, with the perception that the cycles are entirely externally generated.
We really have no sense for cycles. I'd say we are not even near the bottom in California. It could get as bad as Texas. If I were 25 again I would go to law school. I don't see any development future. We at one time thought of establishing a "vulture fund" to buy up undervalued properties which I guess is a recognition of market cyclicality. But buying property speculatively is not a good idea. You pay debt service on it. Can you hold it over the long haul and then sell it and not lose any money? Some may want to just to elevate their ego, to put themselves back up on the same pedestal that devastated them in the first place. [DEVELOPER 4]

DEVELOPER 5, a market research specialist noted for doing the most rigorous market analysis of all those interviewed, admitted to not understanding cycles very well, and like the others, preferred to focus on exogenous factors.

Quite frankly, I am lousy when it comes to cycles. I think they exist but don't pay a lot of attention to them. There are too many other factors that affect supply and demand. External factors make it difficult to look at cycles. In fact, I think they probably negate them. [DEVELOPER 5]

The vice president at the real estate advisory firm acknowledged that there are indeed cycles but there was too much institutional pressure to disregard them. This "herd" mentality is an environmental block that appears to be difficult for real estate investors and developers to overcome.

Real estate cycles?---C'mon. No we don't really analyze them, its outside our area of expertise. Let's put it this way, there is a 'would' question and a 'should' question when it comes to cycles. We like to believe that our clients--institutional investors--are so large that they should be buying real estate all the time. But they aren't. I'm a contrarian at heart. If we believed we should be buying like crazy during the boom, we should be buying like crazy now--sort of like dollar cost averaging for real estate. But the institutional investors won't touch the stuff right now. They all look at each other. It is that herd mentality. Let me give you an example. I'll go to these industry forums where people will pull out newspaper articles that are talking gloom and doom for real estate and then they'll tell you these articles are from 1929, 1974, and 1981. But even with this supposed evidence of real estate cycles in history, you won't change their minds! The pressure of the system is very strong and they can't resist it either way. My sources of capital are very conservative and believe in the herd mentality. [ADVISOR 1]
4. Market Analysis

Market analysis was an area where the most diversity of opinion was found. In fact the interview results represent a continuum that ranges from extremely specific with respect to location and product type [DEVELOPER 2] to in depth, rigorous analysis of supply and demand at the local, regional, and national levels. [DEVELOPER 5]

It ranged from the simple:

...location is a bigger factor than the macro market. I know its cliché but really the key to real estate is location, location, location. We are also very specific in what we look for in apartments. We worry about the design more than formal market analysis. We really believe in small studios. They have short leases so we can raise rents more often, they have higher rents per square foot, plus a higher density per building. They are also easier to maintain because single tenants usually aren't home that much. We also know exactly what are capital expensed are going to be because we have been doing it so long. We prefer if all the apartments are in one tower and they must have one for one parking. We also have a niche with businesses in the area. We furnish a $600 apartment and let companies lease them for $1200 per month. That's cheaper than a hotel. I know this sounds simplistic but that's the way [the CEO and Owner] likes it. He's got engraved on his wall: 2 + 2 = 4, keep it simple. [DEVELOPER 2]

to the intuitive:

We did our market analysis kind of haphazard. [The CEO] had his own feelings about markets and sub markets. He did it by gut feel. His ability was amazing. He could walk along a street and point to [for example] a retail center [in the city]. He'd say 'See that center? It's never in the sun, nobody will walk on that side of the street, it will never work.'---little things like that. It was judgment, just like his decision to locate our offices on the south side of the street instead of the north because he thought it was easier to get to from the freeway exit. As you can see, most of our market analysis was micro, mainly locational. [DEVELOPER 1]

to the analytical:

We do a fairly thorough market analysis. We look at transportation, we do regional analysis as well as national analysis. We pay attention to national economic indicators such as inflation, the interest rate, employment growth by
sector, GNP. We use a lot of resources in our market analysis. We don't grab our data out of TIME magazine. You would be surprised at how much deviation there is in different statistical reports on the same item. So we use many sources. Most of our national information is easy to obtain because we are in Washington D.C. We have an advantage when it comes to that... We also track where firms are coming from. We call this previous location. It is useful in assessing office migration patterns. [DEVELOPER 5]

As can be seen, all of the developers exhibited different degrees of sophistication in their approach to market analysis. Yet there is little correlation, if any, between the level of detail of the market analysis and the relative success or failure of the different firms. A conclusion is reached that a superior understanding of the detail complexity of the market, while providing an advantage over competitors, does not indicate an understanding of the dynamic complexity of the real estate development system. All those interviewed were, to varying degrees, caught in the market down cycle with some of their projects. This is characteristic of the learning disability identified earlier of the "fixation on events and the inability to understand gradual processes". All of those interviewed made development decisions based on market conditions at the time of their analysis. Due to the delay from project inception to realization, the market had changed, both on the demand side as well as the supply side.

The supply side of the market proved difficult to predict, particularly in unregulated markets. The "enemy is out there" organizational learning disability was evident in the development firms that did little formal analysis of the supply pipeline because they believed it was outside their control. Yet it is the supply side reaction, internal to the system, that is a major cause of the boom and bust cycle of the real estate industry.

We do nothing formal about analyzing projects that are in the pipeline, nothing structured. We just talk to people in the industry, learn our markets. [DEVELOPER 1]

Tracking the supply in the pipeline is a real difficult task. Nothing is done formally. Will the office building down the street go--I don't know. It is a total guess and there is a
lot of broker lip service that you have to sift through.  
[ADVISOR 1]

...we had a good understanding of the market. There wasn't  
any real sophisticated analysis of the supply side.  
[DEVELOPER 3]

Several developers recognized the difficulty in obtaining information on potential supply 
and made the point that government regulation helped.

It's difficult to assess the supply side. We don't have a 
formal way of doing it. Word of mouth is usually the best. 
In some respects regulation helps us. For example, in San 
Francisco, there is a proposition "M" that only allows so 
much square footage of space for each type to be approved 
per year. They have a beauty contest between developers 
to see who gets the permits. Right now there are four major 
commercial office buildings that are approved and ready to 
go, but they are all waiting for the market to improve. 
Other than these that we know about, it is difficult to 
determine any other supply that might come on line. The 
regulation helps us though.  [DEVELOPER 2]

Others were very confident in their ability to ascertain supply.

We closely network with all the brokers to get information 
on competitors' projects as well as the status of existing 
leases. In addition, there is a whole network of real estate 
resources out here that gets together regularly and shares 
information. This network includes bankers, brokers, 
architects, developers, advisors. Appraisers are tied into 
this network also. One of the guys in this network actually 
puts out a magazine and a computer database which 
contains valuable market data. The network generates a 
report, "State of the Market," and the end of the year that 
includes net effective rents, absorption rates, floor plates of 
buildings showing how much contiguous space is available, 
etc. Assessing supply is not a problem for us. [emphasis 
added]  [DEVELOPER 5]

An important observation is that even with an accurate assessment of present and future 
supply, the feedback effect of that supply on rental rates and vacancies was not clear.

We paid strong attention to the supply side. But we didn't 
consider that added supply would affect rental rates, we 
figured it would just affect the amount of time it took to 
lease up the property. In our analysis we used some 
generalization for duration such as 1 year for construction, 
1 year to lease up, 3 months free rent, and 2 months to build 
out tenant space.  [DEVELOPER 3]
What problems do we have in tracking the supply side effects? Estimating a correlation between vacancy rates and rental rates is tough. You just kind of wag your finger in the air to determine what it might be. A real tough aspect is trying to figure the expiration date on the leases. [ADVISOR 1]

5. Causes of Oversupply

When asked to elaborate on their perceptions of what caused the current overbuilt market, all interviewed identified easily obtainable financing as a primary cause. This is consistent with the findings of the literature research and demonstrates a tacit understanding of the reinforcing loop of speculative building for investment rather than building for user demand. Developers like to build. As a group they are particularly susceptible to the "I am my position" learning disability. Their expertise, pride, and sense of accomplishment are found in the building process. The easy access to funds for projects allowed developers to build with minimal risk. The combination of someone else's money with the developer's proclivity to build is an irresistible force. Some of the developers interviewed believed that the financial marketplace not only facilitated the overbuilding but in fact was a driving force.

Quite frankly, most of the overbuilding was caused by massive amounts of capital. First there were tax shelters and then the savings and loans and then the Japanese money. It was easy money too. Add to that the fact that much of it was non-recourse financing and the developers were just going to build. [ADVISOR 1]

No doubt about it, it [the building boom] was financing driven. By the time somebody found out a lender made a mistake it was four years down the line. Usually the guy that made the decision had collected his fees and was somewhere else. Plus we put pressure on them too. If a loan officer had financed two of my projects but would not finance a third, I would call up his boss and just tell him I was going down the street to get the loan and what did he think they were doing! We would get the loan eventually. They didn't want the competition to get the business. [DEVELOPER 1]

Financing was a big problem. The banks are supposed to be the last line of checks and balances, but they were just
the opposite. They were too easy. They would rely on the "Made As Instructed" [pun on MAI, the Appraisal Institute designation] appraisals that were, of course, paid for by the developer. The banks had no concept of the market. But not only were the banks too easy, they actually helped to drive a lot of deals. I remember because I worked at as bank for some of that time. Loan officers were given goals that they were pressured to meet: Total amount of loans, total amount of fees, total amount of renewal fees. If you put a banker out in the middle of Monterey, no matter what the market, and you tell him he is going to be compensated or provided incentives by the amount of loans he makes, guess what? He will find a way to make loans!! It got so competitive. Banks were not only making ill advised loans, they were undercutting each other's fees to get the deal.

[DEVELOPER 2]

It was too easy to get money. Development is a very easy process if you can get the money. Financing drove a lot of unnecessary development. Today there is no money for anything. Look at it this way. You own a piece of property--you are the managing partner. All your equity is in that property. Who knows what you paid for it. You prepare a pro forma which includes your estimated land value, which is undoubtedly greater than what you paid for it. You can then sign an interim note based on that estimated land value. All of a sudden you have a check in your hand for the land value of the pro forma. I'm not kidding! [DEVELOPER 4]

Easy lending practices have also contributed to the oversupply. Lenders, financial institutions, developers, all had overconfidence in the 1980s growth in office employment. Of course developers' egos had something to do with it. All developers believe that their building is better than their neighbors. [DEVELOPER 5]

The short time horizons of both developers and investors was determined by those interviewed to also make an important contribution to the oversupply. Many of the completed deals were driven by "up front" fees. The long range consequences of the decision to develop were not given substantial consideration. The paradox is that this short term thinking was driving decisions to build a long lived, illiquid, capital asset.

The problem is that there were too many merchant builders. I call them "briefcase developers." You know, some real estate attorney flies into town, ties up a piece of land, hires an outside architect, and probably convinces a bank who has never even seen the property to loan him the money. [DEVELOPER 2]
The savings and loans didn't help matters either. They were a bunch of idiots that were used to doing single family residential loans and all of a sudden they were doing $30 to $40 million commercial office deals. They didn't know their head from their ass. All they could see was the front end of the deal--the fee. Again it was so competitive. The savings and loans would allow the developer to finance the S & L's loan fees. All the up front "garbage costs" would be financed. There is the joke about the developer driving around in a Rolls Royce with a license plate that says "FIRST DRAW". That is not so far fetched. [DEVELOPER 2]

I analyzed a deal for a large residential development out in [name of city]. It would not pencil out. The deal was bad. My boss told me to submit the report because they were going to do the deal anyhow. Two years later it is a 35 million dollar bad loan for the bank. As banker's would say "the deal was made in heaven" because it sure didn't make sense on earth! I cannot begin to describe to you how pervasive this was. It was very, very, very common! [DEVELOPER 2]

People look a very short term view of things. Bankers and developers did the deals to take out the fees up front. They were not capital investments. Problem was, even if you were a smart developer, you had other guys adding space and therefore affecting the rents of your proposed projects. It would even affect existing projects fully leased up. Lease renewals became difficult negotiations and many tenants would want to renegotiate their leases even before they expired. [DEVELOPER 4]

The short time horizon also led the developers to neglect thinking about the managing their developments as a capital asset. Capital improvements costs could become the demise of a leveraged project.

There were a lot of reasons for bad deals. The biggest reason I think is that of absentee ownership. You build a building, get it full, and leave it alone. Its silly. You have to stay in touch with the market even if you are fully leased, otherwise you can lose the tenants. By the same token you have to keep in touch with the management, other wise your expenses will go up and you will have dissatisfied tenants. [DEVELOPER 2]

The biggest mistake that people make in analyzing deals is that they ignore the capital costs associated with the buildings. They have too optimistic a view of the future. No one figures that they are going to have to pay tenant improvement costs to attract a new tenant when an existing lease expires. They just assume that a tenant will stay there
indefinitely at regularly increasing rental rates. [DEVELOPER 2]

Before I worked here I used to work for a bank and I can tell you, all of the problem loans that I worked on were where the developer got stuck on capital improvement costs midstream. [DEVELOPER 2]

6. Learning

The final question posed to the developers sought to establish (1) what they learned from their past experiences and (2) based on this experience, what changes in behavior would be implemented now and in the future. In essence, did the Kolb experiential learning model apply or were there difficulties in transferring these lessons to future behavior? In general, even after personally experiencing cyclical real estate markets, the orientation of most of those interviewed remained external to the real estate system. This exogenous orientation is especially evident in the comments from ADVISOR 1:

What would I change? Our beliefs maybe. We were so wrong in our beliefs about the market three years ago. Or maybe we just had our timing off. Personally I think we were wrong. We were underwriting properties at 6% cap rates which was crazy. We have also suffered a triple whammy: First, lease rates have plummeted which makes our underlying income stream used in valuation incorrect, disallowing any growth. In addition, the growth we were predicting was possibly unrealistic. Second, our methodology was all messed up. We were believing that tenant [rent] concessions were not part of the marketplace. A 6% cap rate was really wrong. You actually were stabilized at a 4% cap with the concessions figured in. Now that's just rent concessions and does not include any concessions for tenant improvements, which aggravates the valuation further. And third, new projects are now being capitalized at 8 plus %. All these factors combined contribute to a 40-50% drop in valuation. [ADVISOR 1]

DEVELOPER 1 intuitively knew that the decisions made during the boom were flawed but thought that just "being smarter" in the future would improve his development decision making and minimize "bad" development projects:

The guys making the decisions [decision committee] should have been smart enough to know better. They should have seen it. It wasn't just the younger guys either, who hadn't
been through a cycle. Everyone sitting on the committee had gray hair and was in their forties or fifties. But we all got greedy. When we should have sold we would hold out for just a little bit more. They weren't good sellers. They believed all their own lies, all the lies they told the people financing the projects. We should just play smarter. We've got the tools. We should just make the deals and get out earlier. [DEVELOPER 1]

This is an example of Argyris' "skilled incompetence" where the developers may have better insights, but entrenched mental models and defensive routines prevent improved decision making. DEVELOPER 2 exhibited an exceptional sense that history repeats itself and that the development cycle would repeat itself also. As in the study by Jerry Kovach referenced in Chapter Three, DEVELOPER 2 saw part of the boom and bust cycle being caused by new generations making the decisions:

Will the banks or the developers learn? Well, a number of lenders are now saying that they will never again lend on real estate. I have an answer for that. All it takes is just one generation. A generation of bankers and developers to churn through. A generation that hasn't been through the cycles. At the end of the 90s it will happen again, I know it. Look at 1982. Prime was at 19% and there was minimal lending activity. Then prime went down and money started loosening up and building started. [DEVELOPER 2]

One developer managed to overcome the "I am my position" disability to rethink the developer's role in the real estate industry. This individual seemed to intuit what business consultant Stan Davis refers to as the corporate life cycle. Davis submits that all businesses go through a life cycle [i.e. development, asset management, divestiture] and that one should match an organization's life cycle to the business life cycle. According to Davis, "although it is difficult to accomplish, the most effective organization is one that is matched to the same point in the life cycle as the business it serves."

I don't think ever again that you will see speculative development to any degree like we did in the 80s. The developers of the next decade will be tenants. Our whole business right now is finding these guys. That's our market.

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We have had to rethink our entire business. Developers are in a service industry. The tenants are really the developers now and the financial institutions are the real owners. We are just a conduit. These days with all the restructuring of companies as well as firms going out of business, a developer is also a venture capitalist. A lease is only as good as the company that stands behind it. [DEVELOPER 4]

Others interviewed showed evidence of frustration at the present conditions and look toward the marketplace turning around.

The world at [the company] is very different than it used to be. The guys responsible for approval are different. The biggest change is money. Our whole advantage of having ready capital to initiate a deal is gone. The projects have to stand on their own. Debt and equity must be obtained at the local level. The industrial deals we do now are all presold, nothing is spec [speculative]. There is no construction financing available. There is no room for any risk anymore. It is brutal on the partners. You are given incentives to play with other peoples money, to do the deals, and if you hit it right you could wind up making a lot of money. We have lots of young guys out of the best business schools, who are aggressive and sort of deal driven who are now property managers and are not making the same money that was there before. The guys that are left are in a situation where they have to stay. [Partners have ownership in their projects]. They are all just biding their time hoping the market will turn around. [DEVELOPER 3]

I'll tell you those were fun times. I wish there were more of them. [DEVELOPER 1]

Summary of Field Research

Summarizing the field research, the following conclusions are made:

1. Developers have a minimal understanding of the internal dynamics of the real estate industry.

2. Real estate developers have an external orientation with respect to the causes of the overbuilding in the real estate industry.
(3) Development decisions are based primarily on intuition and judgment. Analytical methods are often used to verify predetermined decisions.

(4) Real estate development firms and financial institutions have short term planning horizons and a short term orientation towards risk.

(5) There are several conceptual blocks possessed by real estate developers that conspire to inhibit learning. These are:

-- Environmental Blocks: The system pressure to "do the deals".

-- Stereotyping: Developers look for information to verify what they expect.

-- Availability Bias: Developers use data that is available or recent in making projections for the future. They often use today's market conditions which results in incorrect predictions about tomorrow's market.

-- Self Perception: Developers see themselves as builders and therefore tend to disregard information that tells them not to build.

The following chapter restates these general conclusions and proposes a systems thinking framework for improving organizational learning and consequently development decision making. Systems thinking, combined with the tools of system dynamic computer modeling and the methods of scenario planning shall be shown to help overcome the learning disabilities of real estate developers.
Conclusions

In reviewing the literature research and the field interviews one can conclude that real estate developers do have individual and organizational learning disabilities. These disabilities commonly cause poor development decisions. The combination of the flawed decision process of developers and the illiquid nature of the real estate asset serves to create the cyclical behavior found in the real estate marketplace.

In this chapter, systems thinking, facilitated by the tools of system dynamic computer modeling and the methods of scenario planning shall be prescribed as a methodology to improve real estate developers' organizational learning and understanding of their industry. A simplified model of the commercial office development "system" will be employed to illustrate the usefulness of system dynamic modeling. Arguments will also be made for the implementation of scenarios in the strategic planning process as well as the general use of computer simulation. This planning process provides an ideal forum in which to institute organizational learning.111

Systems Thinking: Mental Models and Computer Models

The first conclusion to be drawn from the research is that developers have a poor understanding of the internal dynamics of the real estate industry. The system dynamic model "map" or diagram illustrated in this chapter allows one to separate the internal structure from the external. [See Figure 5.1 on the following page.]

The Internal Real Estate Development System Structure: This system dynamic model provides an operational, albeit simplified, view of the commercial office

Prototype for this model was developed by Peter Genta of Gould/Kreutzer Associates.
development system, in lieu of the more abstract mental models. **Developer Profit Incentive** is a graphical function (see equations in Appendix Three for coordinates) that has a relationship to **Price**. In an actual application, this graphical function would be determined through econometric analysis. As profit incentive reaches various levels, it influences the decision to develop, indicated by the **Development Rate**. The stock, **New Projects**, is increased by the **Development Rate** and decreased by **Construction completions**. In other words, **New Projects** is the number of projects that are "in the pipeline".

**Construction** represents the number of buildings that are completed during a period of time. As these projects are completed, they increase the total stock of **Office Buildings**. **Office Buildings** are reduced by the outflow of **Depreciation**. Note that the flows **Construction** and **Depreciation** are a function of the variables **Construction Delay** and **Ave(verage) Building Life**, respectively. All of the constants or graphical relationships can be determined statistically, or can even be changed to conform to manager's mental models, and then evaluated. The internal segment of the development system is affected by only one externality, **Price**. But the system feeds back to affect the price by changing the **Supply Demand** condition through the creation of additional **Office Buildings**.

**External Office Demand:** **Supply Demand** represents the relationship of the total **Demand** for office buildings to the actual number of **Office Buildings**. The **Supply Demand** relationship influences the office space users' **Willingness to Pay** and this is therefore reflected in the **Price**. Again these relationships may be established in actual use through statistical analysis of past trends or they may be varied to simulate alternative futures, or both.

**External or Exogenous Economic Factors:** The **Economic Growth** in this sector of the model is set as a function of the **Year**. In this simulation it starts out negative, grows steadily, and then stabilizes at a steady rate of 2.4% annual compounded growth. **Off(ice) Empl(oyment) Growth Rate** is an inflow that increases the total
number of Office Workers. Office Workers can also be increased by Net Migration to the geographic area, but for simplification in this model this flow is set at 0. The total number of Office Workers divided by the Workers per Building results in Demand, the total number of Office Buildings that are needed.

The Behavior Graphs: The behavior graphs allow the real estate developer to quickly see how the long term dynamics of the slow moving real estate development process "plays out" under alternative scenarios. For example, in Figure 5.2 it appears that steady economic growth results in continued office employment growth, and, therefore, a steadily increasing total of office workers. At a more tacit level of understanding, this would appear to be desirable for the development industry, and it is, but with some dynamic consequences. Figure 5.3 shows this paradox. While total office demand is shown to be steadily increasing, the price, total number of office buildings, and new projects fluctuates. This fluctuation is caused by the variations in the Supply Demand ratio due to the strong supply side reactions of the developers, coupled with the delay between initiating a project and completing it. The cause of the cyclical behavior of the real estate cycles is internal to the development system.

In assembling such models, the mental models of the developers are challenged. Senge elaborates on the challenging of mental models:

"Challenging mental models means beginning to reveal internal contradictions, inconsistencies, or incompleteness in prevailing mental models. This is the juncture when team members begin to see that the real purpose of a learning process [through modeling] is not to figure out the system 'out there' but to examine more deeply the world we carry 'in here,' that is, to improve the quality of our own thinking."

In emphasizing the shift from "out there" to "in here," Senge identifies the disability found in this body of research of real estate developers' external orientation. Using a system dynamic model can help the developer to reframe his or her orientation towards

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the internal structure by allowing one to view the counterintuitive results of a simulation. Recalling the developer [DEVELOPER 1] who did not consider real estate cycles in his investment analysis because he projected stable economic growth, this assumed condition of stable economic growth was simulated. As has been shown, the results presented in Figure 5.3 are illuminating. The cyclical behavior still occurs because the behavior is caused by the feedback processes internal to the system on the supply side. [The Equations for the model are listed in Appendix 3.]
Systems Thinking: Improving Developers' Judgment

Another point noted from the research is that developers rely heavily on intuition. Often this intuition resulted in the conceptual block of stereotyping or rather looking for information that supported predetermined mental models, such as continued annual income growth in cash flow projections. This disability was pervasive in the use of discounted cash flow models. System dynamic modeling helps overcome this learning hurdle because in the modeling process the relationships between the variables are developed first before the numbers are input into the variables themselves. This is the first step in moving from linear open loop thinking to systems thinking with feedback loops. System dynamic model maps show the underlying relationships that generate system behavior. Spreadsheets used in discounted cash flow analysis cannot show the process.114 In assembling these relationships in an organizational setting, one improves his or her mental models. According to Senge:

"Improving one's mental models means an ongoing process of explicating, testing, and revising managerial assumptions. In this stage, the team members are creating new constructs and world views, and assessing the consistency of their own policies and behavior in the light of new understandings."115

From the research it appears that real estate developers fall back on intuition and judgment when under pressure. With the environmental pressure to "do the deals," rigorous analysis is assigned a diminishing importance. Systems thinking, through the simulation process, provides an experimental learning environment where intuition can be developed.116 Systems thinking allows a real estate development firm to combine the analytical with the intuitive. It allows for experimentation and risk taking to occur in an

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environment of a "learning laboratory". Rather than analysis being dictated by what can be measured precisely it can be driven by analyzing what factors are important. Systems thinking provides a language for making intuition explicit. As the field research indicates, much decision making in the real estate development process is made on intuition, subjective judgment, or heuristics. Systems thinking combines two contrasting views of management: The strategic, rational, and analytical planning perspective espoused by strategy "gurus" such as Michael Porter; and the flexible, action-biased, operational approach advocated by consultants like Tom Peters.\^117

**Systems Thinking and Scenario Planning: Improving Developers' Time Horizons**

Another learning disability found in the research is the short time horizon of developers and investors. Real estate is a capital asset that has a long life span, yet developers have difficulty making decisions today based on a future so far away. Even the discounted cash flow models that only require a ten year projection provide a time horizon that is too long for developers to conceptualize. Psychological studies have shown that individuals have different orientations toward the future and their relationship to time. The longer the time span the more optimistic people tend to be in their assumptions about the future. Conceptualization is also more difficult with a longer time horizon.\^118 System dynamics computer modeling allows one to compress the development's time horizon and to be able to see quickly the gradual effects of a slowly moving cyclical market.\^119

Scenario planning when combined with system dynamics becomes a useful tool for improving the developer's conceptualization of the future. Scenario planning, first

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introduced at the Royal Dutch/Shell Group planning department was developed to assist managers in dealing with the uncertainty of the future.\textsuperscript{120} It is not possible to perfectly, or even adequately, predict the future effects of various exogenous variables on the real estate development system. Environmental and growth regulations and/or restrictions, the securitization of the mortgage market, changes in the capital markets, changes in commuting patterns, and the overall rate of growth of demand for office space all impact the development industry, and it is difficult to predict how these variables will change. Naive extrapolation of past trends has been proven historically, and again in the field research to be an unacceptable method of forecasting the future.\textsuperscript{121}

Systems thinking, integrated into the scenario planning process, does not attempt to do forecast the future. Rather systems thinking provides a framework for understanding how the development system \textit{endogenously} reacts according to changes in these exogenous variables. The value of systems thinking is that it allows developers to understand the internal dynamic structure of the real estate development industry. One of the fundamental tenets of systems thinking is that structure influences behavior.\textsuperscript{122} In identifying and understanding the structure of the development industry, and putting it explicitly into a model, the developer can then test or simulate various alternative futures and witness how the industry reacts internally. One can model a high economic growth scenario and a low economic growth scenario. An advantage of the computer modeling process is that the developer can simulate the \textit{combined} effects of changes in several exogenous variables and handle the detail complexity that is difficult to manage intuitively. It allows the developer to move from linear, cause and effect thinking and adopt a more dynamic viewpoint of the real estate development market.

\textsuperscript{122}Peter M. Senge, \textit{The Fifth Discipline}, p. 40.
The art of scenario building using systems thinking tools therefore allows the
developer or investor to explore alternative futures and be prepared when one of these
alternative futures begins to materialize. Having gone through the scenario process the
developer is more apt to see market signals that heretofore may have gone unrecognized.
Scenario building is more honest than other methods of forecasting the future. Through
rigorous examination of mental models, developers can determine with a degree of
certainty, the dynamic structure of the industry---this internal structure is the "known".
Then by testing alternative futures one is admitting that he or she does not know or has
very little control over what happens to the exogenous variables. The developer realizes
that he or she only has control over behavior internal to the system structure.
Developing Intuition: Structural Understanding of the Development System

Systems thinking allows one to better intuit the dynamic complexity of the real estate development system. In understanding the dynamic structure the real estate development decision maker moves to a more structural level of understanding of the industry. Peter Senge identifies three basic levels of understanding or explanation that managers use when analyzing complex situations:123

Systemic Structure (Generative)

Patterns of Behavior (Responsive)

Events (reactive)

The flow diagram [See both APPENDIX 2 for a brief overview of flow diagrams and the system dynamic modeling process] is representative of the systemic structure form of understanding where one has a concrete understanding of why compounding interest results in exponential growth and why it takes a long time to initially see the effects. An understanding at this level provides insight into how behavior may be changed.

The patterns of behavior understanding of a system can be demonstrated by the simulation graph. At this level one understands that compounding interest can eventually result in large account balance in the long term. An understanding at this level may reduce the short term, reactive behavior of an individual (i.e. withdrawals). There is a tacit but not articulated understanding of the actual dynamics of compounding interest.

123Peter M. Senge, The Fifth Discipline, p. 52.
The *events* explanation is analogous to linear thinking and is both short term and reactive. At this level of understanding factors affecting the system are external. Most managers operate in this mode, make short term decisions that are highly visible but usually just symptomatic solutions.

Willis Harman of the Institute of Noetic Sciences, formerly the founder of the futures group at SRI (Stanford Research International), has also identified a need for a systems perspective to gain a better understanding of business and societal problems.\(^{124}\) He effectively uses a "health" analogy as a way to illustrate the different levels of understanding, similar to those depicted by Senge.

The first step in diagnosing a person who is ill is to address the obvious symptoms. This is the *events* or reactive level of understanding. A next level is the understanding of how all the symptoms are a complex set of interconnected problems which indicates a disease syndrome. Based on experience and judgment, the physician identifies the disease and prescribes a cure. This is similar to a *patterns of behavior* or responsive level of understanding. An even deeper and more "structural" level of understanding occurs when the physician identifies personal habits or lifestyle that are causing failure of the immune system resulting in disease. It is this level of *systemic structure* or generative understanding that provides the highest degree of leverage in achieving long lasting improvements in the patient's health. This analogy can be applied to the health of an organization.

As the system becomes more complex, the capacity of the human mind to understand that complexity is exceeded. The use of computer modeling helps overcome this intellectual block through the combined use of verbal (names of the variables), mathematical (equations defining relationships), and visual (model diagrams and

behavior graphs) languages. Exponential growth concepts such as compounding interest
[again see model in APPENDIX 2] are often difficult for individuals to intuit. 125

The real estate manager or decision maker who achieves a systemic understanding
of the structure of his industry has a distinct competitive advantage:

"The art of systems thinking lies in being able to recognize
increasingly (dynamically) complex and subtle
structures...amid the wealth of details, pressures, and cross
currents that attend all real management settings. In fact
the essence of mastering systems thinking lies in seeing
patterns where others only see events and forces to react
to." 126

The Benefits of Computer Modeling

According to Edward B. Roberts, a computer model has the following advantages, among others:

"(1) It requires managerial policy makers to improve and complete fully the rough mental sketch of the causes of the problem that they inevitably have in their heads.

(2) In the process of formal model-building the builders discover and resolve various self contradictions and ambiguities amongst their implicit assumptions about the problem.

(3) Once the model is running, even in a rudimentary fashion, logical 'bootstrapping' becomes possible. The consequences of promising but tentative formulations are tested in the model." 127

Computer modeling allows one to "play" with various assumptions and policies with minimal risk, both financial risk to the firm, and personal risk to the individual doing the modeling. According to Gloria Schuck, "computer simulations offer the opportunities to play without risk to the business. Well designed software lets people make conjectures and explore consequences." 128

Computer models make implicit knowledge explicit:

"When a [manager] attempts to construct a set of algorithms that will be the basis for automating some portion of the production process, he or she can first interview those individuals who currently perform the tasks that will be automated. [Managers] must learn the details of their actions in order to translate their practice into the terms of a mathematical model. The algorithms in such a model explicate, rationalize, and institutionalize know-how." 129

Computer simulation models in general, and system dynamic models specifically, allow real world judgment, experience, and decision rules to be explicitly analyzed in a

simple mathematical format. Managers do not make decisions based on complex econometric models:

"The most sophisticated forecasting models are econometric models consisting of thousands of mathematical equations. Yet, from my perspective as an observer, the decision making process did not seem to rely on complex mathematical expressions, but rather on simple expressions of faith in the future. In other words, an element of human behavior enters the decision making process that is not, and possibly cannot be, incorporated into complex mathematical equations."\(^{130}\)

The argument is raised that computer models are just abstractions and are not a true representation of reality. Therefore the validity and usefulness of these models is in question because the people using the models may not accept the results. Indeed, this association of the abstractness of the computer model with the reality it is supposed to represent is an obstacle that has been overcome with other technologies including the telephone, radio, and television. Shoshana Zuboff aptly describes this paradox between symbols, meaning, and the reality being symbolized:

"The civilizing process has increased the distance between behavior and the impulse life of the animal body. It has also produced symbolic media (for example, the alphabet, mathematics notation, printed text) that can both convey and absorb human meaning unfettered by the contextual limitations of embodied presence. With each new medium people have had to revisit the problem of meaning...Language itself is an excellent field with which to demonstrate this historical process...In the modern world, literate minds have long become accustomed to a comfortable unity of the written word and the world to which it refers....In order to achieve some comfort, it was first necessary to encounter the word as a problem and to make its meaning explicit. Once that explicit recognition is accomplished, it is possible to develop a more implicit sense of the word, knowing that, should it become necessary, it will become possible to reconstruct and explicit definition from our reservoir of implicit knowledge...We have made peace with the problem of

meaning in other ways as well. The voice over the telephone, the image in a photograph, the scene on a television screen--each of these is tacitly treated as though they fully convey a reality. We no longer puzzle over their connectedness to the 'real' thing, though it is still possible to find individuals who remember people who were frightened of telephones or looked behind the television set hoping to discover the source of its images."\textsuperscript{131}

In addition, Zuboff argues that, for the manager, this abstraction is good because it allows one to escape the day to day pressures that make it difficult to view the system as a whole. Zuboff refers to the special skills of combining the abstract or tacit with the rational or explicit as \textit{intellective skills}:

"As information technology restructures the work situation, it abstracts thought from action. Absorption, immediacy, and organic responsiveness are superseded by distance, coolness, and remoteness. Such distance brings an opportunity for reflection....[This] thinking...is of a different quality from the thinking that attended the display of action-centered skills. It combines abstraction, explicit inference, and procedural reasoning. Taken together, these elements make possible a new set of competencies that I call \textit{intellective skills}."\textsuperscript{132}


Suggestions for Future Research

This thesis has endeavored to identify some of the learning disabilities present in real estate development firms and identify the recurring flaws in their development planning processes. Systems thinking has been identified as one possible way to overcome these cognitive biases or conceptual barriers to organizational learning. However, further work may be done in the applications of systems concepts to real estate development and urban planning strategies. Some suggestions are listed here:

Identify "Generic Structures" or "System Archetypes" applicable to the Real Estate Development Industry

System Dynamics, Geographic Information Systems and Computer Assisted Planning:

System Dynamics and Corporate Real Estate

Identify "Generic Structures" or "System Archetypes" Applicable to the Real Estate Development Industry

"One of the most important, and potentially most empowering, insights to come from the young field of systems thinking is that certain patterns of structure recur again and again. These "systems archetypes" or "generic structures" embody the key to learning to see structures in our personal and organizational lives. The systems archetypes—of which there are only a relatively small number—suggest that not all management problems are unique, something that experienced managers know intuitively."\textsuperscript{133}

Further research can be done in identifying, testing, and categorizing the generic system structures of the real estate development industry. These archetypes can provide a systems "language" for transferring knowledge in an organization. Real estate

\textsuperscript{133}Peter Senge, \textit{The Fifth Discipline}, p. 94.
development archetypes for different types of development can be created in substantial
detail and used for institutional learning. Causal loop diagrams can be employed as the
language to facilitate both the expression and recordation of these commonly repeated
dynamic structures.

**System Dynamics, Geographic Information Systems and Computer Assisted Planning:**

Computer assisted planning has received praise and criticism. Much of the
dialogue on the use of computer planning is focused on the media function of Geographic
Information Systems (GIS) and the control of this function. The concern over who
d-controls the technology is a valid one, but is not much different than the same conditions
that exist in public forums where the medium is drawings, renderings, and models. The
process has to be managed effectively, but this is not specific to computer technology.

The aspect of the computer simulation capability that shall be addressed here is
the ability to use the computer to sort out complexity and to organize all the
interrelationships and interconnectedness between parts. Often the ability of the
computer to simulate the long term results of proposed development policies results in
insights to all parties that could not have been gained through the traditional rational
planning process. Surprisingly, often simulation will show that policies implemented to
solve urban problems may work in the short run, but when simulated over a significant
time period actually exacerbate the problem.\(^{134}\)

A significant aspect of planning is attempting to predict the future (forecasting)
and then making decisions based on the prediction. In the past, the most sophisticated
forecasting models have been complex econometric models, primarily out of necessity
because computer simulation capabilities were expensive or slow, if available at all.
However, most decisions are not based upon complex econometric models, but are based

on intuition, gut feelings, biases, and rough assumptions about the future. The human element of decision making cannot be described by complex mathematical equations. Computer models allow the complexity to be contained in the interrelationships and the resultant feedback rather than mathematical equations. The mathematics used for computer simulation is far more simple and can be understood by most people. Computer assisted planning can allow for input from concerned citizens (or more appropriately their designated representatives), that minimizes the distrust that usually exists when the results of "expert" research is provided.

An example of a successful use of computer simulation was a transportation study prepared by Barton-Aschman Associates for the City of Long Beach that allowed one to see a graphical plot of traffic conditions on every street in Long Beach during rush hour for any combination of variables (including project proposals "in progress" as well as completed proposals) input into the system:

"Barton Aschman performed various computer runs involving various combinations of growth assumptions and system improvements for its study, as well as for the task force and advisory committee. The task force was able to see the actual effect of the improvements or lack thereof on specific neighborhood streets or major arterials and intersections. The advisory committee could isolate traffic growth factors, an ability that provide it with the means to allocate mitigation costs and benefits fairly."

"The study concluded that stopping growth was not a solution to transportation problems. If Long Beach were to stop growth entirely and make no improvements in the transportation system, traffic stemming from regional growth would throw the system quickly into gridlock."135

The real success of computer assisted planning here is that the methodology allowed the task force members to gain new and unintended insight. Rather than focus on a local development in isolation, the interrelationships with the regional area were taken into consideration and resulted in recognition of an immediate problem that needed

to be addressed regardless of the status of any proposed development. A ride sharing-carpooling strategy was put in place shortly thereafter, unrelated to any future development. One may see how computer assisted planning can dovetail quite nicely with the coordination of local land use controls and state and regional planning needs.

The use of a computer model also forces the planning team to perform rigorous testing of their assumptions of relationships, causality, and scale amongst all the variables that are incorporated into the model. It leaves less chance for personal bias to play a role in the planning process.

Another advantage of computer simulation as a planning tool is the ability to demonstrate, in an understandable medium, the effects of a proposed development that last longer than a politician’s political term of office. It allows for the objective and longer term evaluation of a public official’s policies, a fact which has created the predictable lack of political support for the process.

This thesis has identified the problem of delays in the feedback loop of the real estate development system. There are delays in the public planning process as well. William Whyte in several parts of his book City refers to these "lags" [delays] in much of the planning process, specifically the lag between implementation of a policy and the results of it. These lags create the unfortunate consequence of not learning from mistakes. As Whyte says:

"The problem is asking the questions....The busy work of planning has no room for observation, most certainly not if it could be of an adversarial nature....It is for want of sustained observation that the time lag between the failure of an approach and recognition of it has been so awesomely long....The time lag problem is compounded by yet another kind of time lag. New York has been innovative in planning approaches, zoning especially, and other cities often follow its lead, sometimes borrowing not only the measure but the verbatim text of it. But not right away. They take their time too. So there are two time lags to add

up, with the consequence that cities may adopt a measure just about the time New York is dropping it.\textsuperscript{137}

Computer assisted planning allows one to "ask the questions" \textit{before} the decisions are made. In fact, it can allow one to make mistakes at a much reduced cost. While computer assisted planning has its benefits, it should be remembered that the computer is merely a tool and the true skill is the effective management of the planning process, \textit{aided} by the computer. The "modeling effort is more important than the model itself."\textsuperscript{138}

\textbf{System Dynamics and Corporate Real Estate}

Many organizations with corporate real estate divisions are complex organization with separate divisions, business units, and geographic regions, all interrelated. These complexities and interrelationships require an approach different than the "linear" form of problem solving that is prevalent in management circles today. This linear or "open loop" form of problem solving is also called the problem-action-result sequence as diagrammed here:\textsuperscript{139}

\textbf{FIGURE 5.4}

\textbf{As noted previously, organizational or institutional learning is "the process whereby [separate] management teams, change their shared mental models of their company, their markets, and their competitor's"}\textsuperscript{140} Systems thinking is a tool that

\textsuperscript{137}William Whyte, \textit{City}, pp. 6, 252, and 253.
\textsuperscript{139}James M. Lyneis, \textit{Corporate Planning and Policy Design: A System Dynamics Approach}, p. 11.
may be employed in learning organizations to deal with complex relationships between different parts of an organization such . The reason linear thinking (i.e. problem, action, solution) will be less effective in implementing change in a complex corporate environment is because "complex systems are subject to the following laws:"\textsuperscript{141}

- Today's problems [are caused] by yesterday's 'solutions.'
- The harder you push, the harder the system pushes back.
- Behavior grows better before it grows worse (and vice versa).
- Small changes can produce big results—but the areas of highest leverage are the least obvious.
- Cause and effect are not closely related in time and space.

It has been determined from secondary research that each separate strategic business unit of a corporation could seek to optimize its performance and yet result in suboptimal performance for corporation as a whole. This paradox results from the nature of corporate systems which includes the following:\textsuperscript{142}

(1) Corporate behavior is affected by the \textit{interactions} between parts of the company and the company and the environment.

(2) \textit{Interactions} tend to be more important than \textit{components}---policy design by functional area is not always the most effective.

(3) Long term results may differ from short term results----actions taken to correct an immediate problem may make matters worse in the future. These are also known as symptomatic solutions.


System dynamics and computer simulation provide a vehicle whereby one can test policies that to be implemented at the strategic business unit level and evaluate the impacts of these policies on other areas of the company, and particularly the company as a whole.

Final Comments

The literature research and the field interviews lead one to conclude that the players in the real estate development industry (1) have a poor systemic understanding of the real estate development process, (2) have an external orientation as to the causes of the problems in the real estate development industry, (3) use intuition and judgment over analytical methods in their decision making, (4) have an exceptionally short term perspective for such a long lived asset, and (5) are influenced by individual and organizational learning disabilities which prevent them from improving their mental models of the real estate development system and their place in it. There is a strong need to make conscious efforts to overcome these obstacles and develop a long term, systemic viewpoint of the industry. Real estate developers greatly affect the way that people live. Therefore they have a social responsibility as well as a fiscal responsibility to improve the quality of their decisions.

I wish to end this thesis by quoting from the pages of Max DePree's Leadership Jazz. The quote on the following page emphasizes that although the integration of systems thinking, system dynamic modeling, and scenario planning is an excellent methodology to improve the development manager's decision making ability, it requires the strength and grace of leadership to truly make the effort to maintain a long term systemic perspective:
In the late fourteenth century, the members of New College, at Oxford, moved into their quadrangle, the first structure of its kind, intended to provide for the residents all that they needed. On the north side of the quadrangle sit the chapel and the great hall, beautiful buildings and, as you might imagine, the focus of the life of the college.

In the middle of the nineteenth century, almost five hundred years later, the college hired architect Sir Gilbert Scott to restore the roof of the hall. The roof and the great oak beams that had supported it had badly rotted. And so representatives from the college with Sir Gilbert visited Great Hall Woods, in Berkshire, where they expected to find trees for the replacement beams. Sure enough, the replacements were standing there, waiting to be hewn out of the living oak trees planted centuries before for just that purpose.\textsuperscript{143}

Now that is a developer with a long range vision!

Appendix 1
Causal Loop Diagrams

Hints for Working with Causal Loop Diagrams

Richardson and Pugh\textsuperscript{144} offer some pertinent guidelines for working with causal loop diagrams:

(1) a. Think of variables in causal loop diagrams as \textit{quantities};

b. Use nouns or phrases, not verbs, the actions are in the arrows depicting the causal links;

c. Be clear as to what it means to say a variable increases or decreases. This is a difficult area when modeling soft variables. For example a developer's "attitude toward the market" isn't very clear whereas "optimism about the market" is easier to determine the direction of change (whether it increases or decreases).

(2) Identify the units of the variables in the causal loop diagrams.

(3) Phrase most variables positively.

(4) If a link needs too much explanation, disaggregate it into a sequence of links. The disaggregation of the links allows the diagrammer to make his or her mental models more explicit.

\textsuperscript{144}George P. Richardson and Alexander L. Pugh III, \textit{Introduction to System Dynamics Modeling with Dynamo}, p. 15.
Flow Diagrams:

Flow diagrams make more explicit the system structure that is conceptualized in causal loop diagrams. Flow diagrams provide a more operational view of how the system operates. This convention of "flow" diagramming allows one to better visualize the fluid process of continuous change in systems. According to Richardson and Pugh,145

"Accumulations in feedback systems are variously called stocks, state variables, or levels. The term level is intended to invoke the image of a level of liquid accumulating in a container.....

\[ \text{STOCK or LEVEL} \]

...the flows increasing or decreasing a level are called rates

[or flows]

\[ \text{FLOW or RATE} \]

...the system dynamicist takes the simplifying view that all systems involve continuous, fluid like processes....flow diagrams picture rates and levels [flows and stocks] as stylized valves and tubs."

\[145\]George P. Richardson and Alexander L. Pugh III, Introduction to System Dynamics Modeling with Dynaco, p. 31.
A stock therefore is "an accumulation or integration over time of the flows or changes that come into or go out of that stock. A flow is a rate, decision, action or behavior that changes over time as a function of the influences acting upon it." 146

In describing flow diagramming techniques, I utilize a system dynamic modeling software called iThink147 which operates on a Macintosh148 computer. The symbols or conventions used are those that are commonly employed by system dynamics modelers and are easily transferable by users of other modeling software such as DYNAMO, which has both IBM PC and mainframe capabilities. Also, to minimize confusion, the terminology used for accumulations shall be **stocks** and for rates or changes to the stocks, **flows**.

To further clarify the flow diagramming concepts and to relate it to the previous material, I will create a very simple flow diagram from the causal loop diagram for compounding interest. Remember that the causal loop diagram did not differentiate between the stock and flow variables:

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147 iThink is a registered trademark of High Performance, Inc.
148 Macintosh is a registered trademark of Apple Computer Corporation.
Converting this to a flow diagram, one can hopefully see that the account balance is an accumulation and that the interest is the *inflow* that increases that balance.

![Flow Diagram]

This "cloud" represents the boundary of the system.

Note that (at a given interest rate) the interest is calculated based on the current account balance (in a discrete time period). Note also that this is a positive feedback process—when interest is added (flow), the account balance increases (accumulation), as the account balance increases, the amount of interest added increases, further increasing the account balance and so on in a circular fashion.

To make the model more explicit, the assumed constant rate of interest will be identified by the use of a *converter* which is another system dynamics convention:

![Converter]

The converter is basically a parameter explaining the relationship between variables, in this case the stock and flow. Converters are also known in system dynamics parlance as *auxiliaries*. Returning to the flow diagram we now have:
The equations explaining the relationships are as follows:

\[
\text{Account Balance}(t) = \text{Account Balance}(t - dt) + (\text{Interest}) \times dt
\]

INIT Account Balance = 1000

INFLOWS:
Interest = Account Balance \times \text{Interest Rate}
Interest Rate = .09

The dynamic feedback behavior of the model can then be simulated (i.e. 75 years, quarterly compounding):
Appendix 3
System Dynamic Model Equations

System Dynamic Model Equations
Office_Workers(t) = Office_Workers(t - dt) + (Off_Empl_Growth_Rate + Net_Migration) * dt
INIT Office_Workers = 100000

INFLOWS:
Off_Empl_Growth_Rate = Office_Workers*Economic_Growth
INFLOW TO:
Net_Migration = 0
INFLOW TO:
Year = TIME
Economic_Growth = GRAPH(Year)
(1990, -0.0116), (1993, -0.0056), (1995, 0.012), (1998, 0.024), (2000, 0.024), (2003, 0.024), (2006, 0.024), (2008, 0.024), (2011, 0.024), (2013, 0.024), (2016, 0.024)

Internal Real Estate Dev. System Structure
New_Projects(t) = New_Projects(t - dt) + (Development_Rate - Construction) * dt
INIT New_Projects = 0

INFLOWS:
Development_Rate = Developer_Profit_Incentive*Office_Buildings/Construction_Delay
INFLOW TO:
OUTFLOWS:
Construction = New_Projects/Construction_Delay
OUTFLOW FROM:
INFLOW TO:
Office_Buildings(t) = Office_Buildings(t - dt) + (Construction - Depreciation) * dt
INIT Office_Buildings = 120

INFLOWS:
Construction = New_Projects/Construction_Delay
OUTFLOW FROM:
INFLOW TO:
OUTFLOWS:
Depreciation = Office_Buildings/Ave_Bldg_Life
OUTFLOW FROM:
Ave_Bldg_Life = 25
Construction_Delay = 3
Developer_Profit_Incentive = GRAPH(Price)
(0.00, 0.00), (5.00, 0.00), (10.0, 0.00), (15.0, 0.00), (20.0, 0.00), (25.0, 0.00), (30.0, 0.2),
(35.0, 0.3), (40.0, 0.4), (45.0, 0.5), (50.0, 1.00)

External or Exogenous Office Demand Factors
Office_Demand = Office_Workers/Workers_per_Building
Supply_Demand = Office_Demand/Office_Buildings
Workers_per_Building = 1000

Not in a sector
Price(t) = Price(t - dt) + (Change_in_Price) * dt
INIT Price = Willingness_to_Pay

INFLOWS:
Change_in_Price = (Willingness_to_Pay - Price)/2
Willingness_to_Pay = GRAPH(Supply_Demand)
(0.6, 4.75), (0.68, 6.25), (0.76, 8.25), (0.84, 10.2), (0.92, 14.0), (1, 25.0), (1.08, 33.2),
(1.16, 39.2), (1.24, 44.5), (1.32, 48.0), (1.40, 50.0)
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