DEVELOPMENT OF A MODEL OF THE INTERIOR DESIGN PROCESS

by

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Chapter 1

INTRODUCTION

There is much curiosity about the design process or how a design evolves (Shoskes, 1989). While designers and design students are familiar with the classic project phases, in reality few projects follow a strict progression. Certain constraints such as site, client, etc., dictate the direction of design. Other, often less predictable elements affect the evolution of design. Design is decision making, and the key to successful projects lies not only in the final form but also in the process leading up to it (Broadbent, 1973). A clearer understanding of what takes place along the various stages of the design process and why, would help demystify design and provide a shared vocabulary for clients, designers, and other participants of the design process.

The design process or strategy can be expressed as a sequence of proposed techniques, each likely to generate the answer to a question and enabling the next question to be posed (Cross, 1984). The process of design is seldom simple or direct. It involves much more than applied fashion or style for its own sake (Pile, 1988). Design solutions must respond to diverse pressures, including formal ideas as well as human, environmental, and technical realities. The design process thus evolves out of the interaction of
people, events, problems, ideas, and images (Shoskes, 1989).

**Design Process in Architecture**

The process of architectural design is the translation of information in the form of requirements, constraints, and experience into potential solutions which are considered by the designer to meet required performance characteristics (Luckman, 1967). Some creativity or originality must enter into the process for it to be called design. If the alternative solutions can be determined by a formula, then the process that has taken place is not design. Researchers in the field of architectural design have not yet agreed upon a single set of axioms or even terminology in models they have developed of the design process. Ground that is common, however, is that the design process can be described in terms of a number of stages.

The design process has a certain mystique irrespective of whether it pertains to architecture, interior design, furniture design, apparel design, etc. Architecture is both an art and a science and the architectural design process integrates analysis with intuition. Getting almost any project built today requires a collaborative effort orchestrated with as much innovation and imagination as the creative act of design itself. The need to coordinate the large, multi-disciplinary teams required for the complex architectural/building process itself adds to the complexity
of the design process (Gutman, 1988). As stated earlier, design is decision making, and both the final form and the process leading up to it are important. Poor design decisions can be costly to correct or have lasting social implications.

In his book *Architectural Practice: A Critical View*, Robert Gutman (1988), states that projects are becoming larger and more complex than in the previous decades, thereby demanding new technical and organizational skills. Often, project managers and facility staff play a wide range of roles starting well before the design process begins and continuing long after it has been completed. This involvement may sometimes affect the design process.

**Design Process in Interior Design**

The design process in interior design and architecture are similar in broad terms, such as planning, programming, design development, contract documentation, and contract administration (Ball, 1982). One difference is the shift in focus and scale, which will sometimes alter the way any of these design phases may take shape. Architecture works from the outside in and interior design from the inside out. This could be because architecture concentrates more on the building envelope, its form, setting in site, etc., whereas interior design works more within the confines of the building envelope. Architecture deals with the macro-
environment and interior design with the micro-environment.

It often happens that the classic interior design process is not strictly followed because of financial constraints, clash of interests during the process, change in management, etc. Most interior designers are not satisfied with the notion that their work, when it moves beyond the technical and utilitarian, is merely a matter of taste and whim (Friedmann, 1976). Current literature does not pinpoint the relative importance of phases of the design process or the other unavoidable circumstances that lead to this 'alter and adapt' style of designing. Since it is often difficult to quantify the effects of the latter category, more and more emphasis is being placed on programming, an early phase of the design process, to be a more definite means of targeting and solving the problem.

Programming

Interior design can be viewed as a problem solving process. Programming enters the picture with the recognition that problem definition is no simpler than problem solution (Pena, 1977). A problem needs to be accurately identified or defined before it can be solved. In fact, in ways it can be more difficult to formulate the problem than solve the problem. A program in this context is a problem definition or problem statement (Palmer, 1981).

It should be remembered however that programming leans
more towards the heuristic than the algorithmic (Wade, 1977). A problem-solving procedure that always produces a solution is called an algorithm; one that might or might not produce a solution is called a heuristic. In architectural design, certain factors such as design of simple repetitive structures, heat loss calculations, acoustical calculations, choice of components, choice of cladding panels, etc., can be expressed in the form of algorithms (Broadbent, 1973). Designers have traditionally arrived at design decisions through heuristic procedures (Handler, 1970). That is, they have either solved problems through teaching themselves based on trial and error, or they have worked with ill-defined objectives and equally ill-defined criteria for choosing among alternatives. They have, therefore been dependent on intuitive devices for generating, testing, and declaring solutions reasonable. Programming developed as a response to this method of designing in the 60s and reached its heyday in the 70s (Gordon and Stubbs, 1988).

The general belief is that if sufficient programming is done at the beginning stages of the project, most of these constraints can be defined and ways of avoiding and overcoming the same can be envisaged at the very outset of the project itself.

"A client was provided with a problem identification report (Jacques and Adams, 1974) instead of a sketch scheme. The result was the initiation of the parent company board meeting and a complete reappraisal of the building development strategy. This led to substantial changes in the brief and a much clearer framework
within which to devise an answer to the company's accommodation deficiencies. Programming had clarified how various alternative approaches (not solutions) had different implications for various futures of the company" (Jacques and Talbot, 1975).

Programming, therefore, helps the designer detect what is coming and decide how such factors may affect the product and the process. Furthermore, the lack of clarity in the problem as given may render an alternative approach inconceivable (Rowe, 1987).

Sometimes even thorough pre-design programming is unable to detect potential pitfalls in the design phases ranging from the initial stages of concept development to the final stages of project construction. This is because programming can forecast to a certain degree the way the design process will develop, but cannot totally detect circumstantial constraints such as sudden budget freezes, policy changes, contingencies, etc.

Current programming and related planning activities vary from organization to organization, but the purpose of the process is consistent: to help building owners and planners explore options for meeting their facility requirements. Improved programming has the potential to enhance and clarify these options in a timely manner, and to provide the criteria by which the facility will be designed and evaluated once completed and occupied. Although programming may appear to be a discrete phase in the
building process, it is in fact a continuous process that relates to all activities from planning, budgeting, design, construction, and use of buildings.

Most programming models and methodologies are so broad based that they can be applied to almost any kind of design process - architecture, urban planning, interior design, furniture design, industrial design, product design, etc. The broad based and almost generic programming methodologies come with their concurrent limitations, one of them being that their heuristic nature makes their applicability valid only after certain amount of adaptation is made. This adaptation is made necessary because of the fact that every design is unique and generalizations can be made only to a particular point. Programming is alive in the field of interior design and the commonly adopted programming methods are the ones that the programmer is most comfortable with and also the one most relevant to the project in question.

**Interior Design Research Methods**

The use of systematic design processes or methods especially in the more complex projects, have forced interior designers to work closely and to collaborate with members of other disciplines, especially the social and engineering sciences, ergonomics, operational research, etc., to deal adequately with significant design problems (Stevens, 1975). The designers have turned to systems-
analytic techniques for establishing rational, quantifiable and empirically verifiable tools for design. Designers have also employed the social and behavioral sciences for the information and criteria with which to supposedly concretize their pre-design programs and evaluate their design products (Robbins, 1975). Concepts have been borrowed from the literature of social and behavioral sciences, to justify physical solutions. For instance, designers have uncritically used concepts such as territoriality, autonomy, social and behavioral techniques such as unobtrusive measures, rank order, attitudinal questionnaires, and consensus surveys as methods to gather programming information.

A spectrum of social science perspectives and theories were brought to bear concerning design questions. To some extent, these theories varied according to which stage of the design process they were applied (Bechtel, Marans, and Michelson, 1987). Research for design therefore considered the needs of special populations and how these interact with the physical environment. Methodological approaches varied according to the sub-population involved (Zimring et al., 1986).

Although the environment is designed for the most part to accommodate certain explicit and implicit types of behavior, careful planning based on rigorous and relevant research was found to be necessary to eliminate the
possibility of certain kinds of undesired behavior. Oscar Newman (1972), brought up this issue in describing his attempt to redesign high-density residential settings to lessen the possibility of criminal activity.

Once the opportunity for behavior had been taken into consideration, however, it does not necessarily follow that the desired behavior will necessarily occur. The norms governing peoples' activities in particular environments should be taken into account as well. Edward Hall in The Hidden Dimension (1966) referred to the fact that in any culture the rules guiding how people deal with one another have a strong spatial dimension. Notions of privacy differ from culture to culture, but imply identifiable standards in a given setting. Within this normative perspective, Robert Sommer (1969) has contributed considerable information and work on institutional settings through his handling of environmental implications of interpersonal and spatial norms in such settings as classrooms, libraries, and mental hospitals.

Observation, an unobtrusive method of data collection for basing design decisions, has been explained in the works of Bechtel (1965, 1967, 1971, 1976, and 1978), and Zeisel (1978) among others. The practical applications of surveys both as pre-design information gathering instruments, and for evaluation of built environments ranging from micro to macro in scale have also been well documented in the
literature. Pioneers in the field among others have been
and Wiseman (1986), Harris, L. and Associates (1978, 1980),
Sanoff (1977), Zeisel (1975, 1982), and Zube (1976).

The past two decades have seen the development of many
innovative design research techniques and methods, one of
the most notable being simulation. Simulation and gaming
were often based on the concept of trade-offs. This method
recognized that resources were limited and that
unfortunately not all needs and desires could be met. A
large number of books, including directories of simulation
games have appeared (Robinson, 1975). Two periodicals
expressly devoted to the subject of gaming and games
emerged: Simulation and Games, an international journal of
theory, design, and research which is published quarterly;
and Simulation/Games/News, a bi-monthly publication contains
news about the latest developments in gaming.

Recently the initial enthusiasm among designers about
the role of socio-behavioral sciences has become clouded
(Robbins, 1975). Doubt has arisen about what role the
social scientist should assume in the design process. If
the designers are truly to address the problems of the
relation between social analysis and design, they should
begin to examine not only the data coming from research but
also the underlying assumptions defining the data. What is
important to understand is that even with given data derived from the same empirical source, different researchers could generate different interpretations and applications based upon differing belief systems. Therefore, it is incumbent upon the designers who seek the advice of the social scientists, that they understand the assumptions, premises and ideological biases that may underlie and define the research of any social scientist (Robbins, 1975).

Psychology, sociology, and other human sciences have offered a great deal in the way of theoretical structures that can be applied to design. These disciplines offer techniques for analyzing relationships and, to some extent, they offer results from such analyses which may be applicable to design. Ergonomics, operational research, information theory, and computing also offer techniques which may be useful in design. Yet the impact of research from these disciplines on the designer in practice has been very small indeed (Broadbent, 1973). Something clearly is wrong.

In his book, Design in Architecture, Geoffrey Broadbent (1973), states,

"......difficulties have arisen for several reasons. One is that because there has been no real tradition of design research - apart from certain aspects of history - it has been common to bring in researchers from fields....... physicists, psychologists, sociologists, and so on (Broadbent, 1970). They brought with them their established disciplines and methodologies, together with ideas as to what constituted a "good" problem; there was no intention, certainly of solving the designer's practical problems. An "applicability
gap thus arose between research and practice" (RIBA Report, 1970)." (p. 364)

This was aggravated by the need most researchers had, for reasons of prestige within their own fields, to demonstrate the rigor with which they could apply research methodology. This, in most cases, meant an empirical, astronomy/physics-based methodology, in which individual factors in the man/environment relationship had to be isolated for observation and/or experiment. The tendency to publish the research in scholarly journals rather than trade journals that designers may read, led to the further increase in the communication gap between the researchers and designers. Increasingly though, scientists in many disciplines have begun to take a broad perspective again, to think in terms of 'wholes' rather than 'parts' and clearly this approach seems far more sympathetic to the traditional designer.

Miller and Schlitt in their book, Interior Space: Design Concepts for Personal Needs (1985), focused on the interior design process based on environmental design research, which can be used for arriving at possible design solutions. They strictly caution the reader that,

".....in many cases, these design concepts are based upon untested applications of theories, personal hypotheses, and generalizations of data (sometimes from research on exterior environments). Our ideas need empirical verification and we hope that psychologists who read this book will be stimulated to conduct such badly needed interior design research."

A systematic approach to problem solving based on a
sophisticated analysis of the design process, and also relative amounts of relevant research to back the decisions, can provide a focus for design activities, minimizing the likelihood of wasted effort or unsatisfactory solutions. Further development of the design process in interior design will help break down the myths of traditional intuitive design, and will permit a more rational understanding of the interior design activity.

Although there has been considerable attention given to analyzing design processes, it happens that almost all the research was done in the fields of architecture and urban planning. Even in these two fields there is more work to be done and researchers are presently working on ways computers and other products of information technology can be incorporated in the architectural design process to further simplify the process. A number of architectural researchers concerned with the design process have become involved with information processing theory (Rowe, 1987). This has provided a basis for the contemporary work in computer-aided architectural design, particularly for attempts to develop "complete and hospitable design environments." Here the work of Negroponte (1970, 1972, 1974), Mitchell (1977), and Eastman (1975) provide clear examples.

In interior design there has so far been very little attempt to formalize the design process through research (Cross, 1977 1985). On account of the increased
specialization in the design field, there are constant changes in the nature of the interior design activity. New research in other aspects of interior design, architecture and allied fields also contribute to the change. Massive amounts of information are being generated by research. If these discrete pieces of information could be integrated, they would complement one another. It could also lead to progress in defining interior design research in general and the formalization of the interior design process in particular. The formalization of the interior design process is therefore the next obvious step in design process research.

**Statement of the Research Problem**

**Purpose**

The purpose of this study was to describe one direction the design process in interior design could follow. The study also focused on how interior designers could design the process itself to result in a better project. A model for the interior design process was developed. The model was applied in a case study.

**Justification**

The field of interior design research is still in its early stages, and current literature shows that there has
been little research conducted on interior design processes. Design process studies have been carried out in urban planning and architecture; however, the very scale and focus of these fields are different from that of interior design. The design process has such an overriding effect on the quality of the designed product or facility that failure to develop the process will only hinder research efforts and make interior design continue to appear more intuitive than rational. This thereby calls for interior design to formalize its design processes. The sooner interior designers dispel the myth that all they do is mere cosmetic treatment, and the sooner they back their claims with rigorous and scientific research, the faster the profession will be able to advance.

Design processes that draw from state of the art research in allied fields can serve as a guide for achieving excellence in design while still meeting the needs of the client and the community. It is the hope that the following case study will help define the process more clearly. It will also help to make the interior design process more comprehensible, as all the phases of the process can be easily related to appropriate developments in the design project itself.

Objectives

In order to accomplish the purpose of this study, the
following objectives have been formulated:

1. To trace the development of the design process in fields closely allied with interior design, such as architecture and urban design.

2. To develop a model of the interior design process.

3. To apply the model in a case study.
Chapter 2
REVIEW OF LITERATURE

What is design?

Design is a purposeful activity (Kaufmann, 1981). It is not an end in itself, but a means for accomplishment. It is a tool for change toward meaningful objectives. Interior design is a goal centered activity, concerned with the immediate human environment and how it affects the user. Interior design touches the lives of all of us in a very direct way. A complex and constantly changing field, interior design overlaps and interlaces with related professions, architecture in particular, and to a lesser degree, industrial design, exhibition design, stage design, and other more specialized fields (Pile, 1989).

Before going any further, it is necessary to define what we mean by design. Many people think of it as pattern or decoration, as, for example, a design for wall paper or printed textiles. Others associate it only with fashion design or stage design. In engineering, design may deal with developing structural members, piping, or ducts; while in the fine arts it deals with the way an artist organizes the formal elements of line, shape, color, and texture in a space.

In interior design and architecture, the term describes the decisions that determine how a particular object, space,
or building will be organized (Pile, 1989). It can be described as determination of form, with form understood to mean every aspect of every quality, including size, shape, materials, structure, texture, and color, that makes one particular physical reality different from any other (Friedmann, 1976). It is design differences that make one house different from another, one room different from another, and that also allow us to speak of one example as better or worse than another.

**Design Process**

"Could we have found a better answer had we used another approach?" This question is fundamental to any formal inquiry into the nature of the methods/processes used to solve problems. A galaxy of questions can be posed by combining design processes used by the design disciplines within the content areas. Prior research has considered characteristics of the problem solver, such as past experience, creativity, and motivation, and all but ignored the relative merits of a particular design methodology/process in aiding a given problem solver (Nutt, 1974).

A **design method or process** can be defined as a strategy to solve complex problems employing an explicit pattern of steps, typically in a particular sequence to identify and elaborate cost effective solutions to meet a prescribed purpose (Nutt, 1974). Some call design methods and
processes "problem solving" (Simon, 1969), others refer to it as "planning" (Jakobson, 1971; Le Breton and Henning, 1961; Delbecq and Van de Ven, 1971), "systems engineering" (Churchman, 1968), or "systems analysis" (Ramo, 1969).

Design methods have been devised for a wide array of content areas and problem types such as production or manufacturing processes and machine design in firms (Asimov, 1962); to develop housing projects (Warfield, 1974); to devise welfare payment procedures (Delbecq and Van de Ven, 1971); for creating aesthetically pleasing and functional arrangements in interior design and architecture (Eastman, 1970), in facilities planning (Archer, 1969); and to cope with policy matters such as utilization of shore lands (Jakobson, 1969).

The design processes have been developed by drawing on many diverse schools of thought, such as mathematics, operations research, philosophy, management science, and sociology, psychology, as well as empirical evidence, based on human behavior, and personal beliefs (Nutt 1974). Many distinct processes of development have been used including: observing successful designers, studying human problem solving, thorough introspection, adapting the tenets of the scientific method, or using a known principle, such as a decision making model to formulate a methodology.

In the model in Figure 1, a design method is described as a process with a number of interrelated stages. The term
design method is used synonymously with design process; and it can be defined as a particular series of steps, phases, or stages required by a particular design project, as well as the sequence in which these steps, phases or stages should be performed. The model proposes a sequential movement from the abstract to the concrete by moving through the formulation, concept, detailing, evaluation, and implementation stages. The process is characterized by feed-back and feed-forward, among stages for modification at any level of detail and iteration. Either one, or all of the stages can be repeated to produce an alternative, or to refine a solution concept.

History of the Design Process

Design has long been considered a uniquely human process relying on intuition, experience and judgement of the designer. The study of design as a process can be viewed as an effort to rationalize and explicate the knowledge necessary for its conduct (Harfmann, 1987). Externalization of design knowledge has increased the predictability and consistency of design processes, but has also tended to fragment the holistic process of design into discrete sub-disciplines. A review of the major developments in design methodology illustrates that the externalization of designers' knowledge has brought about rationality of the process.
Figure 1. Generic Design Model Developed by Nutt (1974).
Before the 15th century, design was a craft process of solving a problem through the actual creation of an artifact. The knowledge required to create the design was held solely by the craftsman or artist. The process was controlled intuitively and followed the simple sequence of problem definition-problem solution.

In complex situations, such as the creation of large buildings, this method of solving the problems "in the field" led to the development of a series of sub-problems. These problems were solved by experienced craftsmen as they emerged based on knowledge accumulated through years of practice and techniques passed down through the history of their crafts (masonry, carpentry, goldsmithing, etc.). Each of these craftsmen individually held very specific knowledge about products and processes relating to their area of expertise.

Dissemination and transmission of design knowledge has occurred throughout history by apprenticeship or the documentation of rules, such as the Ten Books of Architecture by Vitruvius (translated by Morris Hicky Morgan in 1914). However, the first major step in externalizing the design process itself occurred during the Renaissance, when theoreticians sought to synthesize humanistic and philosophic ideals with practical knowledge about the building crafts. With the emergence of perspective drawing, the era saw architects such as Brunelleschi using accurate
drawings and scale models to examine solutions prior to the actual construction of buildings. Renaissance architects solicited professional technical consultants from various trades to improve the quality and utility of their proposed designs (Ettlinger, 1977).

The separation of the architect from the builder marked the beginning of design-problem solving as an abstract process removed from the manufacturing of the object. The use of scale drawings and models to represent design intentions resulted in a major change in the sequence of the design process as previously practiced. A solution could now be generated, at least conceptually, in an abstracted, accurately proportioned form, and reviewed by the related craftsmen prior to its actual construction (Harfmann, 1987).

With problems of increased complexity, the craft methods of solving problems proved to be too expensive and too slow (Alexander, 1964). Abstraction of the designed object, therefore, allowed a series of iterations to be performed for the purpose of refining the project. This iterative process suggests a further externalization (dissemination) of design processes, including the ability to change the solution based upon the analysis of the experienced craftsmen. Iterative design, which evolved from the trial and error methods of the past, were used, although perhaps not formally, by Sir Christopher Wren in the design of St. Paul's Cathedral, where physical scale models were
built and studied to improve and develop design ideas (Wilton-Ely, 1977).

All the above mentioned processes were still in their formative stages and no formal study of design processes and methods as a distinct subject in its own right was attempted. The next phase in both the further development and externalization of the design process started when designers felt the need for the process to be documented (Harffmann, 1987). Simultaneously the rapidly developing scientific and industrial fields forced the designers to think in terms of scientific ways of formalizing the design process. This was aided by the fact that by the early 1960s, systems engineering, ergonomics, operational research, information theory and cybernetics, not to mention the new math and computing were all available to the design theorist in highly developed form. Several events marked the emergence of design processes and the formal study of the same from these sources as a discipline in its own right. This was first seen most clearly at the Ulm School of Design, the Hochschule fur Gestaltung, where Maldonado and others sought to establish a 'practical anthropology' in which the designer would be integrated very closely into society, operating at the nerve centers of the industrial civilization, precisely where industry makes the most important decision affecting peoples' daily lives (Maldonado, 1958).
In 1956, Maldonado took over as Chairman of the School. He pursued a much tougher, scientifically oriented line replacing the 'art and intuition' process that his predecessors had propagated and favored (Broadbent, 1973). One approach to this methodology was described by Hans Gugelot, lecturer in industrial design at the Hochschule and designer of those cult objects of the 1960s, the Braun fan heater, record player and other electrical appliances. Gugelot's (1963) design method was as follows:

1. Information Stage
2. Research Stage
3. Design Phase
4. Decision Stage
5. Calculations
6. Model making

Gugelot wrote as a practical and highly successful designer; indeed most of the staff at Hochschule acted as consultants to the industry. Virtually every product from Ulm displayed the same characteristics - from the first complex grid exercises done by students, to the products ranging from typography to architecture, produced by the staff. It is ironic perhaps that the school whose name is associated most particularly with rational methodology could produce the most canonically perfect objects in the entire history of design (Broadbent, 1973).

Nevertheless, Maldonado certainly pursued a serious
interest in the science of design, exemplified in an article which he wrote with Bonsieppe (1964) entitled 'Science and Design.' This consisted of a thorough review of the source disciplines especially vector analysis, matrix analysis, linear programming, mathematical analysis of complexity, topology, cybernetics, the theory of algorithms, experimental psychology, and anthropology. As one might expect, this drew on the work of others which in the early 1960s had to establish design method as a discipline in its own right. Much of this, curiously enough, dated from 1962 when Morris Asimov produced his Introduction to Design, the first book in a projected series edited by James B. Reswick (1962), of the Case Institute of Technology under the title of The Fundamentals of Engineering Design. Other titles in the series were Reliability in Engineering Design (Reethof and Queen), Design with Computers (Curry, 1963), Communication in Engineering Design (Rosenstein, Rathbone and Schneerer, 1964), and Creativity in Engineering Design (Alger and Hays, 1964). Asimov describes design most entirely in terms of information processes. It consists, he says, of

"...the gathering, handling, and creative organizing of information relevant to the problem situation; it prescribes the derivations of decisions which are optimized, communicated, and tested or otherwise evaluated; it has an iterative character, for often, in the design new information becomes available or new insights are gained which require the repetition of earlier operations."
Asimov's method derived very clearly from systems engineering and, like Hall, he described two scales of operation, one looping within the other. He called the larger of his two scales of operation, his strategy, the design morphology and it was comprised of the following stages:

1. Feasibility study - phase I
2. Preliminary design - phase II
3. Detailed design
4. Planning production process
5. Planning for distribution
6. Planning for consumption and
7. Planning for retirement of the product

Asimov also outlined a general process for solving problems which he called the design process including the following stages:

1. Analysis
2. Synthesis
3. Evaluation
4. Optimization
5. Revision
6. Implementation

He saw his design morphology as the vertical structure of engineering design and his problem-solving procedure (his design process) as its horizontal structure. By the time Asimov's book was published, people other than engineers had
become interested in what systems engineering, operational research and the other new fields had to offer in design. The first Conference on Design Methods was held at Imperial College, London, in September 1962 and, significantly, its organizers included a professor of building science, two engineers, two industrial designers, an artist, a typographer, two architects and an ergonomist. In addition to this range of interests, the speakers also included a town planner, a psychologist, a computer engineer, a professor of logic and a cybernetician. The aim of the conference was,

"......to bring together people of common interest and purpose,...... in their own special fields of the arts and sciences,........to discover the possible connections that link all creative activities."

Many barriers arose from the fact that each of the new disciplines which seemed relevant to design had its own formidable jargon. To outsiders some of the new disciplines seemed to have various features in common. Yet, in each case, the respective protagonists claimed that theirs was the original discipline and that the other was an offshoot or a subset which could be contained within it.

The next major step that fostered the development of the design process was the introduction into the academic mainstream. There was a Conference/Course at Ulm in April 1966, which was organized by Denzil Nield of the Department of Education and Science, for British teachers of
architecture, on the subject of "The Teaching of Design Method in Architecture". At the conference a series of design method projects, based on systematic methods was devised for use in schools of design. It was followed by a feedback meeting at Attingham Park in November, 1967 (Starling, 1966, 1968).

In December 1967 the School of Architecture, Portsmouth College of Technology organized a large conference on Design Methods in Architecture (Broadbent and Ward, 1969). In addition to these, the Design Research Society was formed in Britain (London, April 1966), Design Methods Group (DMG) and the Environmental Design Research Association (EDRA) in the United States. DMG produces a newsletter and organized a large conference at MIT in April 1968, (Moore, 1970). At this same time EDRA meetings are held each year at different locations including Chapel Hill (Sanoff and Cohn, 1969), Pittsburgh (Eastman and Archea, 1970), and Los Angeles (Mitchell, 1972). Parallel to all these developments, a number of design theorists were trying conscientiously, to look at what the designer actually did in practice, and to formalize the design process on this basis.

The emergence of scientific methods of resolving many traditional problems from sunshading and daylighting to anthropometrics to network theory, made it seem that with a little further application of ideas from engineering and mathematics the whole design process could be simplified and
perhaps perfected (Heath, 1972). Shortly afterwards, a mathematically inclined architect, Christopher Alexander, published what was to be one of the most influential books in the field, Notes on the Synthesis of Form (1964). The methods and processes proposed in these discussions were what are now being called 'first - generation': that is, endeavors to apply mathematical models to the design processes developed first in operational research.

**First Generation Methods**

The first generation methods in general sought to revise the approach to design, such that solutions evolved logically from an appropriate stating of the problem rather than some preconceived notion of solutions (Nasar, 1980). These approaches often broke problems into parts, analyzed and solved the problems of the parts, and recombined the parts into a synthesis solution. The emphasis on analysis, logically derived solutions, and the need for testing resulted in processes where all decisions and decision criteria were made external. The designer was no longer to be a pure form manipulator for the sake of art, but instead was to derive solutions from "user needs" (Alexander, 1964), or from "behavior" (Studer, 1968).

While these methods dethroned the designer, they created a new elite - the methodologist. The methodologist, while interested in new solutions derived from actual
problems, served the role of an information processor placed between users and the design. As such, the methodologist might ask or observe potential users for idealized behaviors, or ask users for desired adjacencies (Sanoff, 1977). Then the methodologist would take the information received in parts, analyze it, and create a product such as a behavioral flow diagram, setting diagrams, or an adjacency matrix or graph.

In using such a process, the methodologist suffered from the same problem as did the designer before the appearance of the design methods. The methodologist used a set of preconceived notions about problem types (questions to ask). While the problem types might make sense, it is quite possible that by only asking a limited number of questions, certain important problems were overlooked. The methodologist, in fact could have limited the breadth of the solution by the limits of the questions asked. In addition, the role of information processor might be interpreted as a barrier between the people and their design.

Second Generation of Methods

In response to the problems of the first generation design method, a proposed generation of methods, incorporating both participatory decision making and the expert was needed (Nasar, 1980). In this evolution of the model, the experts would play the role of providing
technical information (whether it be design, methodological, or other) not decisions. The people would make the decisions. Such an approach improved the growth potential for users by providing them with the right to decide and the information to make good decisions.

Later it was felt that it would be far more efficient if the "experts" and users were all one programming team. Research efforts in this direction are well on the way and, one method, the use of trade-offs, was an outcome of these efforts. Trade-off questions examine the actual choice people would make when they are faced with hard decisions between desired attributes (Marans, 1978). Nancy Canestaro (1987), developed "The Workstation Game" (Figure 2), for office planning, based on the trade-off concept. The game is used to gather input from users for the design of their own working environments. The introduction of gaming into the process allowed users to go through a series of iterations in the design of their work spaces. The process does not function as a true game in the sense of playing with or against other people; however, it challenges the participant to reach a goal, which is to design the optimum cost effective office (Canestaro, 1990). It has been shown that if the individuals on the team respect one another's special skills, see one another as equals, and seek a solution through cooperative endeavors rather than isolated efforts, the results are likely to be good (Bennis, 1973).
Figure 2. Conceptual Model for Workstation Game Study (Canestaro, 1987)
Programming and the Design Process

As the design process developed, a consensus was reached that it could be divided into three very broad phases: 1) programming, 2) planning and design during the design activity, and 3) post programming (Wade, 1977). Programming is basically defining the problem, and addresses statements of purpose, behavior, function and object. Planning during the design activity converts behavioral statements into functional statements and develops relationships between the function statements. Design converts function into object statements and concepts are translated into physical form. Post programming involves evaluation studies, usually completed after the facility has been occupied for a certain period of time (Wade, 1977).

Programming soon grew into a specialized field in its own right, with many of its leaders and followers forming one of two major schools of thought. These schools of thought centered more on the person who used/conducted the process rather than the actual process itself. The first group, including William Pena of Caudill, Rowlett, and Scott, (CRS Sirrine Group), believed that programming was a distinctly different activity from designing and had to be carried out by programmers as opposed to the designers themselves. The group believed that the two activities, programming and designing, required different kinds of thought processes and hence had to be done by different
individuals who would be qualified to do one of the two (Palmer, 1981).

The second group, including Jay Farbstein and John M. Kurtz, believed that programming and designing went hand in hand, and the two were parts of a dynamic system that had to be undertaken by the same group of people (Palmer, 1981). Irrespective of this difference in thought, they all maintained and agreed that programming formed a vital part of the entire design process.

Programming

Programming is probably as old as architecture or for that matter any kind of design activity. Every design project has had a program, either implied or stated, that prescribed what the design needed or should accomplish. Through most of the formal history of design, a program has been an informal matter - a simple, verbal statement of requirements from one individual directly to another (Palmer, 1981).

As facility requirements and other influencing factors have become more complex, diversified and specialized, the need for thorough and systemized methods of investigating and identifying problems has intensified. The development of programming as a process and as a service over the past third of a century has been a response to this need.

Although programming has been recognized as a distinct
function, if not service, in the design (particularly the architectural and interior design) profession, few efforts have been made to develop its potential until recently. A notable exception is the CRS Sirrine Group. The firm and one of its principals, William M. Pena, FAIA, have probably contributed more to the formalization and popularization of the programming process than any other single architect or firm. CRS has used the problem seeking method for years on many projects and is respected and admired for its pioneering work in programming. The firm has further shared its findings with the profession in seminars, and workshops, and even through a video tape, the resulting book, *Problem Solving: An Architectural Programming Primer* (1977), represents an effort in dissemination.

Programming models and methodologies have been developed over the years with the methodologies often being shaped based on previously developed models. There are two distinct models in programming, one of which was developed by Gerald Davis and the other by William Pena.

**Gerald Davis** (1979) specializes in pre-architectural programming. He has identified three distinct types of programs. The first two are the responsibility of the client and may be developed by consultants such as Davis (Figure 3). The third is prepared by the design architect of the project in response to its functional and technical programs. Davis believes the two activities should be
Figure 3. Gerald Davis' Programming Model
performed separately by separate teams. Davis' programming model (Davis and Szigetti, 1979) begins with pre-programming and moves through evaluating the facility in use. It is directed toward the planning of corporate facilities. Throughout the design process, the programmer provides feedback to the designer. After the facility is built, the programmer assists management in moving into the facilities and in fine tuning them. Post occupancy evaluation of the facilities is usually done in six months.

William Pena's model is characterized by clarity, efficiency, and economy in both procedure and product (1977). The programming matrix or model represents five procedural steps (Figure 4). Pena believes programming is a separate process from designing and should precede designing in any project. He also advocates delivery of program information to the designer in two phases: 1) schematic program for schematic design and 2) development program for design development.

The methodologies that have been articulated by practicing programmers and designers vary in complexity and detail, in comprehensiveness, and in specificity. They have been developed and refined through the experience of the individuals to match their work habits, judgement of program content, and philosophies. During the 1960s and 1970s programming as a separate activity was a central focus in design.
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Figure 4. William Pena's Programming Model
In the 1980s however, there has been more emphasis on style and end product than on building performance or user needs (Shoskes, 1989). Programming remains an essential part of what the designer does, but has been absorbed into the design process to a greater or lesser degree, depending on a firm's philosophy. After programming reached its heyday in the 1970s, within a short time there was an apparent relative diminution of programming as a design topic. This could create the impression that programming is now taken for granted as being an inherent part of the design process (Gordon and Stubbs, 1988).

**Coordinating Interior Design and Architecture**

Historically, most interiors were put together successfully as a natural part of building structures (the architecture). Ancient and still surviving primitive societies developed various forms of dwellings to solve the problem of shelter in a particular climate with the locally available materials and usually in a vernacular style. They then simply took their possessions inside, and the resulting arrangements in the interior was practical, and often in its own way handsome (Pile, 1988).

Developing civilizations found appropriate ways of building more elaborate structures, creating their own kinds of interior space. One cannot think of the interior of a Gothic cathedral apart from the structure of the building
itself. The glass, additions of carved wood, and other decorative elements created a consistent whole, inside out. At least until modern times, interiors thoroughly compatible with the enclosing structures were created.

It is with the development of more elaborate buildings that the idea of an interior as a designed unit, comparable to a fashionable costume as an expression of wealth and power as well as taste emerged (Pile, 1988). Modern industrial society has added tremendous technical complications, both in the nature of buildings themselves and in the variety of specialized purposes that the spaces contained within are expected to serve.

Interior design implements and qualifies spaces so that they serve the many uses for which they are intended. The plan and space potential with which the interior designer deals are directly dependent on the structure of the buildings. This close treatment suggests that the interior design is most congruous when it seems part of the whole design process and product (Ball, 1982). The designer should be capable of appreciating the vision behind the creation of spaces. A disjointed interior and exterior suggests some malfunctioning in the aesthetic handling. There should be some overall compatibility in choices and arrangements of the design elements. This does not necessarily impose a slavish restriction in the realm of style. The designer's aim should be to use the qualities of
the interior and exterior to generate synergy.

Two of the world's greatest designers, Frank Lloyd Wright and Le Corbusier, though almost diametrically opposed in their design philosophies and styles and actual designed forms, have always prided themselves on being 'total designers.' They both designed the exterior and interior to harmonize perfectly with each forming the appropriate setting. Wright's houses had interiors that reflected the project and its architectural character. Separating either the building envelope or its interior from the other would create an incomplete effect. His works are meant to be seen as 'total designs', where neither the architecture nor the interior took precedence over the other. Instead they both blended, and though they sometimes stood out as separate distinct entities of one system, they still reinforced the fact that they were complementary parts of a harmonious whole.

Le Corbusier was a strong advocate of the International Movement, which unlike the Organic Movement of Wright, wanted a clear distinction between the building and its setting (site). He, like Wright, believed that architecture and interior design had to balance each other. Sometimes in his projects the architectural and interior design entities flowed into each other so that the overall effect was one sculptural mass. It was difficult to draw a line distinguishing architecture and interior design (for
example, Ronchamp Chapel).

In the wake of all this however, we should not overlook another school of thought, which is more popular in modern day designs and which is rapidly gaining popularity. This school of thought advocates that the interior and exterior be considered two separate systems. The only connecting link is the fact that architecture encloses the interior design and that the interior design was enclosed by architecture.

Though this link was acknowledged, the propagators of this school of thought chose to underplay this particular fact and focussed on other different issues which they felt were of more importance. The architecture, or the exterior of the building projects a particular image, character, and look, and the interior is in a totally different, though not diametrically opposite mode. The entire or total design concept is summed up as being "a functional surprise" (for example, architects Rogers and Piano in their design of The Pompidou Center in Paris). Often it is easier to identify with the functional part than the surprise part. This is because the exterior in itself does what it is supposed to do and so does the interior. Some of the examples are very sophisticated and highly original designs by skilled professionals (Friedmann, 1976). Arthropods by Jim Burns, deals with this trend in the United States and Europe. Most projects included in the book are futuristic, often based on
conceptual thoughts with shock value.

**Design Process - Discussions**

Design is a holistic process (Lobell, 1975). A very large number of theorists, scientists, and designers have described, with varying degrees of detail and sophistication, both problem-solving and design processes (Wade, 1977). One of the most extensive lists of the various design processes appears in a Ph.D. dissertation by D. Michael Murtha (1973, pp.125-130). In an appendix Murtha records the solution sequence listed by some forty different writers. These writers are categorized by their concern with listing basic steps, operations, problem solving procedures or design processes. Under design processes Murtha subdivides these writers by their disciplines of concern: systems design, engineering design, machine design, environmental design, etc.

The review of literature has indicated the need for formalizing the interior design process. Significant building blocks needed for the development and formalization of the interior design process have already been carried out in architecture. Instead of re-inventing the wheel, possibly the best way to go about this is to document the design processes already being used by practicing interior designers. This documentation could be further refined by drawing from research in socio-behavioral fields,
ergonomics, lighting, color studies, etc. A thorough and rigorous pulling together of information already available from subsets of the interior design field along with proven techniques of design processes is needed in a comprehensive design process model. State of the art technology such as computers and data-management systems could be integrated to simplify the process, especially if the amount of information to be dealt with is copious.

Those who have devised a design process often assume that their procedures can be applied to any type of design problem (Gregory, 1966). Thus, though the "content-free" nature of design is often asserted, no experimental evidence exists to justify such an assumption (Nutt, 1975). This led Nutt to propose the hypothesis that a given design process will produce superior solutions for a particular set of problems. This point helps focus on the fact that the interior design process however similar to design processes such as architecture and urban planning needs documentation and development of its own unique design process. External factors which may influence the design process include the designer and the design team, environmental factors, organizational factors, design problem characteristics, new patterns of activity, goal conflicts, problem and policy statements, etc.

This thesis takes a step towards documenting the
interior design process. Information already researched in different areas within the interior design field and in allied fields such as architecture and urban planning was explored to develop a model. This model described in detail in Chapter 4 should help formalize one direction that the interior design process could take. Chapter 3 discusses the case study and method used to apply parts of the model in a design project.
Chapter 3

PROCEDURE

Though design processes have been around for the past three to four decades as formal fields of study in architecture and industrial design, there has been little or no attempt to examine similar issues in interior design. A detailed case study of an interior design project, focusing simultaneously on both the process and the product, will help in the better understanding of the interior design process. It will also help establish the need for formalizing the interior design process.

The Case Study

The case study chosen was the Center for Agricultural Research and Education (CARE), at Virginia Polytechnic Institute and State University (Virginia Tech), Blacksburg, Virginia. The proposed facility is under the design auspices of the University Planning Services at Virginia Tech.

The Site

The site for the proposed facility is Whitethorne Plantation, a 1,700 acre farm on the outskirts of Blacksburg. There is little existing vegetation save a clump of trees around the Whitethorne Manor. The Manor is
going to be restored and will be used as a guest house facility. Whitethorne Manor will not affect the development of the CARE facility in any way. There are no existing buildings in the area designated for the CARE facility.

Budget

The projected budget to date is approximately $9.2 million. The project is planned to be completed in phases. No definite decisions have been made so far on the number of phases the entire project is going to include or how the phases are going to be distributed over time.

Program

A team of faculty members from the College of Agriculture, selected by the Dean, assessed and arrived at what would be the needs of the proposed facility. The following guidelines were developed based on the information gathered. The CARE facility will essentially consist of members from four major departments, each having their own specialized requirements. Only the facilities that have been highlighted in the following listing were used for the case study. They were chosen because of their inherent potential for creativity and interior design flexibility. The other areas in the facility have overriding technical and specific needs, and hence were not considered a part of the case study. The units not included in the design
project are: 1) the Production Facility, 2) the Research and Learning Area, 3) the Environmental Chamber, and 4) the Industrial Facility.

The project architect-in-charge, Mr. Ben Johnson, arrived at the specific square footage requirements of the spaces based on architectural and planning standards. As of May 10, 1988 the Capital Needs at Whitethorne Plantation were identified as:

1. Common Use Facilities

Note: (Facilities that were considered for the proposed design are highlighted in the following listing).

A. General Purpose Facility (13,300 total sq. ft.). A general purpose facility for the College would have as a minimum, the defined spaces that are listed below:

(1) Classroom/ conference room (1600 sq. ft.) with movable partition, blackboard, projection screen, shades, chair, tables.

(2) General use laboratories (5x400 sq. ft. each).

(3) Walk-in cold room (225 sq. ft.)

(4) Computer Terminal room (200 sq. ft.) with access to PC's and terminals connected to the campus computer.

(5) Office Facilities (850 total sq. ft.): Farm coordinator's office (250 sq. ft.), Horticultural manager's office (150 sq. ft.), secretary's office (150 sq. ft.), and one common use office facility for use by all departments (300 sq.ft.).

(6) Lunchroom/kitchen (400 sq. ft.) with cabinets, tables, sink, refrigerator,
stove and other appropriate appliances to accommodate food functions related to meetings and conferences.

(7) Two restrooms (325 total sq. ft.) (inside and outside entrances) with lockers and showers.

(8) General storage Facilities (4000 total sq. ft.).

(9) General work area connected to units 10, 11, 12, and 13 (500 sq. ft.).

(10) Refrigerated seed storage room (800 sq. ft.) with humidity and temperature controls and shelves.

(11) Non-refrigerated seed storage room (1200 sq. ft.) with humidity control and shelves.

(12) Seed treatment room (500 total Sq. ft.)

(13) Plant preparation Facility (700 sq. ft.)

(14) Soil grinding and Preparation room (100 sq. ft.).

B. Equipment Repair Facility (7700 total sq. ft.)

C. Pesticide Storage and Dispensing Facility (3800 total sq. ft.)

D. Machinery, fertilizer and soil storage (10600 total sq. ft.)

E. Automated weather station. (200 sq. ft.)

2. Special Needs - Department of Horticulture

A. Fruit Packaging/Cold Storage Facility (450 sq. ft.)

B. Field Building at the Orchard (1800 sq. ft.)
Concept

The overall concept developed by the University Planning Services, after consultation with the clients and ultimate users (the College of Agricultural Sciences), was a "farm house" concept. The major objective in designing and building this facility in addition to functional efficiency, was to create an environment where the interior design, architecture, and landscape design would blend into each other to form an overall farmhouse effect. This does not mean that the interiors are to be equipped with old-stone age technology, and the exterior of logs. The exterior or the building envelope will probably be metal sheds (for ease of erection and cost considerations) but the interiors are going to be very much "state of the art in a technological sense." As Dr. Andy Swiger, Associate Dean of the College of Agricultural Sciences, stated,

"..... this facility will take us into the 21st century and will have to reflect that kind of technology."

State of the art technology will be reflected in the equipment, and furnishings.

Scope of the Case Study

The building envelopes had been designed based on approximate estimates of space and functional needs. During the interior design process the overall form of the building changed as the activity areas within the building were
detailed.

Blending such a high tech interior with the simple "farmhouse" exterior was in itself a design challenge. Designing the facilities and documenting the process, involved clarity of the design process documentation, objectivity, rationality and creativity that was a challenge to the interior designer.

Another inherent challenge in the project, which might not necessarily affect this thesis, was the fact that the facility was going to be built in phases over a period of several years. This meant that after each and every phase the currently existing facility should look complete and not seem unfinished or abrupt.

**Process**

The design of the facility was done following the new model of the interior design process described in the next chapter. The design process and product were two inherent parts of a dynamic system, and underwent a series of iterations.

Documentation of the process was by graphic flow charts, and posing what-if situations where needed. Rationalization of the process was by detailed explanation of design decisions that were taken. The finished design, therefore not only consisted of the completed design drawings, but also a set of complementary documentation
diagrams that show every step of the interior design process.

**Analysis**

Shifts in the design process and their corresponding impact on the remaining part of the process and the design itself were examined. The analysis also helped in gaining insight into ways of overcoming constraints. The interior design process in general and the specific design process in this project in particular were also described and analyzed.
Chapter 4

DEVELOPMENT OF THE DESIGN PROCESS MODEL

A model is a representation of some past, present, or future object or event, used for communication or for dealing with problems. There may be a considerable degree of transformation between the representation and that which it represents (Gregory, 1966). Developing a design model is much like developing a new product. As the model develops, it should cycle through the formal phases of problem identification, concept formulation, solution specification, solution implementation, evaluation, and documentation (Miller, 1973). Tondl (1981), states that,

"..... as a rule a design process model is an organized sequence of activities arranged in series or in parallel, among which there are certain information links. This means that the results of one group of activities may form part of the information prerequisites of another group of activities. In a system model of the design process as a whole, therefore, it is possible to reconstruct a network of information channels connecting the blocks of individual activities" (p. 115).

The Applicability Range of Design Models

E. T. White (1972), explains the use of models in the design process,

"Where there are complex operations to be performed or a large body of information to be presented, the use of models often proves beneficial. Models or paradigms provide a way of understanding information or operations and their relationship and so also serve as means of organizing and presenting ideas about both."
Design process models have the potential for encouraging thoroughness, for shaking up and exposing the values or world views underlying design decisions. They also help to make the bases of design decisions understandable, for purposes of communication, comprehension, recording, and remembering. Models that live up to these expectations should also be those that increase the problem solving leverage of designing.

As the global standard of living is elevated, and as individual expectations are directed toward quality rather than quantity in the environment, designers have neither the time to meet the demands placed upon them, nor the mental capacity to cope with problems and variables of increasing scope and complexity. As demands on the designer increased, rational models were soon transformed from a luxury to a necessity (Neukermans, 1975). However, design models do not necessarily make problem situations simplistic. Instead, they help the designer make difficult operational decisions under complex conditions (Thomson, 1973).

A number of critical assumptions have been made about design models: that design models produce solutions with similar patterns of functional and dysfunctional characteristics, that design models produce results superior to unstructured heuristic approaches, and that design models are content free - working equally well to solve a wide array of problems. Because of the radically different
procedures, rationales, and content areas used to develop design models, Nutt (1975) hypothesized that a given design model will produce superior solutions for a particular set of problems.

**Design Process Models in Architecture and Urban Planning**

Many design models have been developed in architecture and urban planning. These models drew inspiration primarily from process models that were developed in the more controlled fields such as industrial design, and product design. Obviously, the models in industrial and product design had to undergo a great deal of adaptation and modification in order to develop into specific architectural or urban planning models. Moreover, most of these design models were and still are more applicable in the programming and planning phases of the process than in the design phase (Wade, 1977).

With increased specialization in various fields and increased diversification in building types, many design theorists have formulated design models that require widely different application skills, technical support, budgets, etc. The models themselves range from very simple broad based operations to extremely detailed and thorough stages/phases attempting to make a complete sweep of almost every facet of the design process. The effectiveness of any of these models, in addition to the model in question, often
depends on many intrinsic and extrinsic variables.

Some of the design models are discussed below. These models have been developed sometimes with emphasis on certain parts of the design process, rather than the entire design process. For example, William Pena's model (refer back to Figure 4) emphasized almost entirely the first stage of the design process - programming. Gerald Davis' model (refer back to Figure 3) focused on the programming stage and the evaluation stage - the first and last stages in the design process.

Evans and Wheeler (1969) proposed an architectural design process model, in *Emerging Techniques*, for the American Institute of Architects, Washington, D. C. Their model, which was one of the pioneering total architectural design models, since it addressed the entire design process and not specific parts of it, focused on two aspects - the entire design process, and the accompanying documentation process that forms an indivisible part of the design activity. Their model has been graphically presented in Figure 5.

Michael C. Cunningham and Barbara Flynn (1976) of the New York design firm, M. Paul Friedberg and Partners, developed and used an urban design model for the State Street Mall in Madison, Wisconsin. Community participation was viewed as part of the overall planning and design process. Their design process model was flexible and could
Figure 5. Architectural Design Process Model
(Evans and Wheeler, 1969)
accommodate changes. They also reiterated that their model, though comprehensive and to an extent generic, would have to undergo adaptations to be used in other urban design problems. A graphic representation of the urban design process model is shown in Figure 6.

The central task of the models discussed above is to conceptually structure the rational character of the design process. Jones (1975), succinctly brings to mind an important but not often discussed aspect of the design process models,

"The skeptic may be concerned that the conceptualization of the design process in the form of models or paradigms, has overlooked its most pronounced feature - creativity. On the contrary, this conceptualization of the design process, whether specifically referring to the institution of architecture or referring to action in general, is based on the tradition of a rationalistic philosophy of mind, which has been persistently concerned with the "creative" aspect of the human action" (p. 330).

Design Model in Interior Design

Unfortunately, we have today very few carefully documented case studies of interior designers working with particular user groups in particular problem contexts. Likewise we have very few carefully documented cases of the use of systematic methods in interior design problem solving (Gast, 1975). The firm Caudill Rowlett Scott (CRS Sirrine) documented for ASID (American Society of Interior Designers) a typical interior design project as comprised of five broad
Figure 6. Urban Design Process Model
(Cunningham and Flynn, 1976)
categories namely, programming, schematic design, design development, contract documents, and construction. Their model is graphically represented in Figure 7. It is evident that their model deals more with interior design documentation rather than the interior design process. Interior designers have little or no documentation of the interior design process by way of models or methodologies. This does not mean that interior design is any less a creative and/or rigorous profession compared to architecture or urban planning. A model of the interior design process that is an adaptation of certain relevant parts of urban design models and architectural models is discussed below.

Development of an Interior Design Process Model

An explanation of some of the terminology used in describing the development of an interior design model will help in the comprehension of the rationale behind the model. Broad areas which can be further broken down by discrete activities are called tiers or levels. Each level has one primary aim and may have several secondary functions. For example, the first tier/level is the information level. This level is comprised of any and all activities that will help produce, verify, or probe information necessary for the design project in question. The separate activities that make up each level are called activity blocks (Figure 8). The second and third levels also have their unique set of
<table>
<thead>
<tr>
<th>Phase</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Programming</td>
</tr>
<tr>
<td></td>
<td>Interview reports, final program</td>
</tr>
<tr>
<td></td>
<td>10%</td>
</tr>
<tr>
<td>2</td>
<td>Schematic design</td>
</tr>
<tr>
<td></td>
<td>Schematic design presentation, models, sketches, renderings</td>
</tr>
<tr>
<td></td>
<td>15%</td>
</tr>
<tr>
<td>3</td>
<td>Design development</td>
</tr>
<tr>
<td></td>
<td>Detailed presentation boards, swatches, color chips, renderings, photos</td>
</tr>
<tr>
<td></td>
<td>25%</td>
</tr>
<tr>
<td>4</td>
<td>Contract documents</td>
</tr>
<tr>
<td></td>
<td>Contract documents plans, specifications</td>
</tr>
<tr>
<td></td>
<td>35%</td>
</tr>
<tr>
<td>5</td>
<td>Construction</td>
</tr>
<tr>
<td></td>
<td>Punch lists, compliance and status reports</td>
</tr>
<tr>
<td></td>
<td>15%</td>
</tr>
</tbody>
</table>

Figure 7. Typical Project Documentation

(ASID Developed by CRS)
LEVEL 3  |  P1  |  P2  |  P3  |  P4  |
LEVEL 2  |  A1  |  A2  |  A3  |  A4  |  A5  |
LEVEL 1  |  I1  |  I2  |  I3  |  I4  |

KEY:
P1, P2   Products of the Design Process
A1, A2, A3 Design Activities
I1, I2, I3 Information Activities

Figure 8. Conceptual Diagram of Terms Used in Model
primary and secondary functions. The second level - the design process level deals with the creative act of designing. This act is not a one shot activity. Instead it is a series of steps, each building on the former and gradually leading to the solution of the design problem. The second level uses all the information gathered and researched in the first level, to help shape the design and to make relevant and judicious design decisions. The third level - the product level is an outcome of a combination of the first and second levels. For example, different data gathering techniques (in the first level), help do the programming (in the second level) to produce the programming document or the needs assessment document (third level).

The Interior Design Process Model

The interior design process model was conceived and developed by the author primarily as having three broad levels/tiers - information, process, and the product levels (Figure 9). The information level leads to the process level. Since it is inconceivable to have all the information before any part of the process level (the design level) is started, it usually happens that activities in the process level are started when adequate but not necessarily all the information is known. The information level is further broken down into a sequence of activities or activity blocks, each of which may correspond to one or more
Figure 9. Three Levels/Tiers of the Interior Design Process Model
activities in the **process level** (Figure 10). Some of the activities in the information level include different kinds of information gathering techniques, relevant codes and standards, specific area requirements, client philosophy and image, unique features of the project, organizational set up, budgets, etc. Similarly the process stage also is broken up into more discrete blocks, each corresponding to its concurrent outputs - drawings, models, mock-ups, specifications, the installation, etc. These outputs or hard products form the third level or tier - the **product level**. Evaluation and iteration are assumed to take place within the activity blocks, between activity blocks in the same level, between activity blocks in different levels, and between the levels themselves.

In other words, the information level corresponds to the programming part of the design. It also includes any information that will be used during the design process and even after the process, if need be. The process level corresponds to the designing part which uses the information from the preceding information level, to base the design decisions on. Some of the typical activity blocks in the process level include concepts, schematics, preliminary space planning, detailed space planning, design details development, feasibility, etc. It should be noted however that the activity blocks within each level or tier, though often represented as being discrete activities are in
KEY:

P1, P2  Products of the Design Process
A1, A2, A3  Design Activities
I1, I2, I3  Information Activities

Figure 10. Conceptual Framework of Levels and Blocks in the Model
reality continuous progressions. The dividing line between these activities - where exactly the conceptual activity ends and the schematic activity commences depends on the specific design project, its scope and nature, the designer and the designer's work mode, time, monetary limitations, etc.

Another point worth remembering is that there are prescribed business procedures that are concurrent with various activities in the entire design process. The way the business procedures operate often depends on factors such as the nature of the project, design firm set up, time frame, budget allocation, phasing, governmental control, client type, etc. Since the developed interior design process model is not aimed for use by just one kind of design firm or for one particular kind of interior design project, the business procedural part of the process was omitted. This omission would give the potential users of the model, an opportunity to integrate their characteristic business procedures in the model.

The model is represented graphically in Figure 11. For clarity and consistency all the activities in the design process level (A1, A2, A3,.....) are enclosed by circles, and the activities in the product level (P1, P2, P3,.....) by rectangles. The activities in the information level (I1, I2, I3,.....) are represented as running checklists, that can be modified, altered, added to, subtracted from, etc.
Figure 11. The Interior Design Process Model
depending upon the particular design project.

The design level has been highlighted because it forms the fulcrum of the entire design process, with the two adjacent levels either feeding into it or leading to products as a result of it. Due to the partly hypothetical nature of the design project chosen to apply the interior design process model (the project will not take physical form after the design is completed), not all levels and not all activity blocks could be applied and documented. Due to the fact that most of the information was readily available to the author from the project brief and the needs assessment survey, the information level with all its blocks could not be applied.

The model also considers the interior designer to be an integrator of sorts and to help in the interface between architects and technical experts such as lighting designers, furniture designers, etc. The personnel block above the entire interior design process model indicates who the people involved at various stages would typically be. Clients and users are also included, in order to foster user participation and additionally as a means of achieving more viable solutions through participatory design.

Application of the Interior Design Process Model

The case study (CARE project) was chosen in order to apply parts of the interior design process model. Since the
designing of the project was only to the space planning stage, the specific area of the model that was applied has been highlighted (Figure 12). The next chapter, the CARE project design process documentation, explains in greater detail the various steps taken in applying parts of the model to the project. The three main activity levels in the process level that were applied were concepts, schematics, and space planning. Evaluations and iterations were made during the process, wherever found necessary. Concurrent activity blocks in the adjacent levels, the information level and product level, were also applied and documented.
Figure 12. Part I of the Interior Design Process Model
Applied in a Case Study
Chapter 5
APPLICATION OF THE MODEL IN A CASE STUDY

To test parts of the interior design process model explained in Chapter 4, a case study was chosen. The case study was the Center for Agricultural Research and Education (CARE), at Virginia Polytechnic Institute and State University, Blacksburg, Virginia. Since the model was used as a guideline all through the interior design process of the facility, the design is explained by correlating it to a particular activity in the model. The parts of the model that will be applied in this case study are shown in Figure 13.

It must be reiterated here that programming for the design was already done. In the program document the requirements were detailed in terms of the specific facilities required and their approximate square footage. The square footage of each area came from arrived from architectural and planning standards.

Conceptualization

The conceptualization activity in the design process was the first step towards converting needs and requirements into what could be the possible realized form. During this activity, broad guidelines identified through programming are used to create a framework to develop the design.
Figure 13. Part II of the Interior Design Process Model

Applied in a Case Study
These guidelines not only shaped the design and the decisions but also helped steer the design through more viable channels. Both availability of pertinent information and its interpretation were found to be important.

The activities in the information level and the product level relating to the conceptualization activity in the interior design process model are shown in Figure 14. The information level for this activity furnished a few points that had to be considered in the design (Figure 15). The broad conceptual guidelines included:

1) The overall form of the Administrative building had to be such that it could fit in with the rest of the site plan.

2) The allocated square footage of the areas had to be followed, with a certain amount of flexibility. This flexibility allowed the designed areas to be within plus or minus 10% of the allocated square footage.

3) The most important point that was stressed in the program, and was taken into consideration in the design, was phasing. Since the entire building was not going to be built all at one time, the facilities had to be grouped and designed in such a way that after every phase the building would look complete and would function as a complete self sufficient unit.
Information Level
- Design intent,
- Client image,
- Unique arch. features,
- Circulation patterns, etc.,

Process Level

Conceptualization

Product Level

Concepts

- Prelim. adj diagrams,
- Thumb nail sketches,
- Block plans,
- Link diagrams, etc.,

Figure 14. Information and Product Activities Relating to Conceptualization in the Interior Design Process Model
Figure 15. Conceptual Guidelines
4) Since the total concept focused on simplicity and efficiency, the administrative building was designed giving priority to the same factors.

Building on the information available and as the first step in the conceptualization, the general requirements were grouped into various categories as classrooms, laboratories, faculty offices, etc. (Figure 16). This categorization helped in the understanding of which spaces were mandatory in the first phase, and which spaces could wait until subsequent phases. This grouping also helped in the conceptualization of the possible phasing of the facilities (Figure 17). Figure 18 shows how the design progressed at the conceptualization level. Since the laboratories had a lot of chemicals, both toxic and non toxic, a "what if" scenario was posed in order to solve the issue as to whether the laboratories had to be isolated or included with the classrooms. It was decided to have all the classrooms on one side and all the laboratories on the other side. This arrangement had the following three advantages over the arrangement where the classrooms and the laboratories would be grouped together. The advantages were:

1) All the ducting and other pipe connections for the laboratories could be concentrated on one side of the building rather than scattered over many segments of the building.
Figure 16. Grouping of General Requirements
Figure 17. Possible Phasing of the Facilities
Figure 18. Building Form/ Layout Concept
2) Control of the entire facility became easier with the laboratories on one side.

3) Most important, the separation of the classrooms and the laboratories helped in the successful phasing of the building.

Other concepts included making the building forms either symmetrically or asymmetrically balanced. As a means of facilitating phasing, a stringer concept, where the segments could be located on either one or both sides of a central corridor was developed.

All the above formed part of the product activity related to conceptualization. In addition design details in the form of thumbnail sketches also helped channel the design solution. Figures 37, 38, and 39, developed during this stage are explained during the schematic activity.

**Schematic Activity**

The scheme is the design activity immediately following conceptualization. The genesis of the scheme occurred during the conceptual stage itself. During the scheme, the design concepts were filtered and those concepts that helped solve the design problem were retained. The concepts that did not help in the design solution were eliminated. The schematic activity brought the design more into focus since more definite terms were brought into play at this stage. The information and product activities that related to the
scheme in the interior design process are shown in Figure 19.

The information activity for the scheme was a more refined form of the information from the conceptual stage. The information from the conceptual stage, which was more generalized, was now made situation specific. When the adjacency diagrams were done and the spaces were arranged along a double loaded corridor (keeping with the stringer concept), it was possible to create blocks or segments that would facilitate both the efficient functioning of the building and the phasing requirements. Figures 20, 21, 22, 23, 24, 25, 26, 27, 28, and 29 are space layout templates that were developed for the scheme. These templates are minimum space requirements needed for the activities in a particular space or area. Figure 30 shows the location of the building on the site. Figure 31 shows the initial massing of the building forms. Landscaping was also considered as a design element. Figure 32 shows the first phase of the building (a "what-if" scenario), and Figure 33 shows the building in its final phase. Figures 34 and 35 are iterations of the scheme. Figure 36 is a schematic drawing where all the dimensions of the space were generated. Figures 37, 38, and 39 are conceptual sketches that were applied in this stage. These last three figures added details to the scheme and considered design aspects such as skylights over the corridor, water bodies as
Figure 19. Information and Product Activities Related to the Scheme in the Interior Design Process Model
Figure 20. Sketch of Space Template - Classroom

No. of rows: \( x = \frac{(5+4)}{3} = \frac{9}{3} = 3 \) row.

No. of columns: \( x = \frac{(6+1)}{3.5} = \frac{7}{3.5} = 2 \) columns.

Ideal capacity = \( 3 \times 2 = 6 \) students.
Figure 21. Sketch of Space Template - Farm Manager's/
Horticultural Manager's Office
Figure 22. Sketch of Space Template - Computer Room
Figure 23. Sketch of Space Template - Graduate Students' Carrels
Figure 24. Sketch of Graduate Students' Carrels (option)
Figure 25. Sketch of Space Template - Faculty Office
Figure 26. Sketch of Restroom Option I
Figure 27. Sketch of Restroom Option II
Figure 28. Sketch of Space Template - Restrooms
Figure 29. Sketch of Space Template - Lunchroom/ Kitchen
Figure 30. Site Plan Showing Location of the Proposed Building
Figure 31. Basic Massing of the Building Segments
Figure 32. First Phase of the Building
Figure 33. Building Layout After Final Phase
Figure 34. Scheme - After First Revision
Figure 35. Layout Showing Area Requirements
Figure 36. Layout Showing Revised Area Requirements
elements of interest, indoor landscaping, possible level changes, exposing the structure as part of the building theme, etc.

**Space Planning**

Space planning is one of the most important activities in the interior design process. In fact any mistake that was overlooked at this level will become compounded in subsequent stages. Space planning was made easier and chances of loop holes were reduced since many variables were considered in the preceding stages (as was the case in this design). The templates of the space layouts generated in the schematic phase, helped channel the space planning activity.

Figure 40 shows the information and product activities relating to space planning. Herman Miller furniture systems were used, because they are currently on the state contract. Codes and standards were followed during the space template generation. National Building Code (NBC) and Building Officials Code and Administration (BOCA), guidelines set specific dimensions in case of the corridor width. The codes and standards also helped address factors such as occupancy load, number of exits, dead ends, extent of restroom facilities, clearances, etc. Barrier free codes were also followed where relevant. Figure 41a shows a complete layout of the building. Figure 41b (in the pouch)

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Figure 38. Conceptual Sketches II
Figure 39. Conceptual Sketches III
Figure 40. Information and Product Activities Related to Space Planning in the Interior Design Process Model
is an enlarged version of the same. Figures 42, 43, 44, 45, and 46 are enlarged detailed versions of each of the separate blocks or segments in the building.

The design of the facility was pursued only to this stage; since only the conceptualization, scheme and space planning activities from the interior design process model were applied. In reality these activities would be followed by detailed space planning, interior design details, detailed specifications, etc. The interior design model helped the design of the facility by being a constant reminder of what was done and what more had to be done during each and every step of the process. Chapter 6 discusses some of the limitations of the interior design process model. Implications for future research are also given.
Figure 41a. Furniture Layout
Figure 42. Detail - Lounge/ Central Segment
Figure 43. Detail - Laboratories - First Phase
Figure 45. Detail - Laboratories - Second Phase
Chapter 6

DISCUSSIONS AND CONCLUSIONS

The interior design process model developed in this thesis was applied in a case study - the Center for Agricultural Research and Education (CARE). Any newly developed model in a creative field such as design should undergo a series of iterations, and after repeated applications become fine tuned to the best possible form. The interior design process model developed in this thesis has been applied in only one case study, and in this case only parts of the model could be applied. The limitations of the model and the implications for further research are also discussed below.

Limitations and Features

Only a part of the CARE project, the Administrative building, was used to apply the interior design process model. Since the programming part of the project was done by the architects and faculty members well before this thesis was conceived, the initial portion of the model - the information gathering or the programming part - could not be applied. At the other end of the model, the design stages could not be developed into detailed stages because the project was still in its formative stages. Few decisions concerning exact budget, range of facilities, systems to be
used, time schedules, specific phasing details, etc., had been made at the time of this thesis. In addition, because the design of the Administrative building was still on paper and had not evolved into its final built form, post occupancy evaluations of the facility, as a means of evaluating the process model and the designed product, was not possible.

One of the best features of the newly developed interior design process model is the fact that it is quite generic and yet specific to interior design. In the model (refer back to Figure 11), details listed above the process and product stages can be used as a checklist for going through a project; and detailed project management tracking systems can be developed for each of the points as well.

Implications for Future Research

In keeping with the scope of a master's thesis, the interior design process model was applied in only one case study. The newly developed model will be more effective when it is applied in many different interior design projects. After each situation the model could be re-evaluated and refined. Post occupancy evaluations of the built facility (where the design was carried out using the process model) would help evaluate both the design process and its concurrent product.

This model builds on models in architecture and urban
planning to rationalize the interior design process. Products of information technology, such as computers, specialized software, and data base systems can be incorporated with the model to become project management for the interior design process. This technological enhancement will aid in the simulation of performance of materials and combination of materials in case of fire, checking for codes, conducting building feasibility, and for comparing budget-design product efficiency. The design of complex and multi-use facilities will become much more efficient and manageable if more research is carried out to achieve these goals.

Summary

The rationalization of the design process had its genesis in the 1920s in industrial design and operations research. In just a few decades the design process models underwent rapid alterations and numerous iterations with the result that many design fields began rationalizing or attempting to rationalize the design process. The review of literature traced the development of design process models in fields allied to interior design, such as architecture and urban planning. There is little documentation of the interior design process in the literature.

A model of one of the ways the interior design process could be documented and hence rationalized was developed.
It should be noted however that any model in a creative field can only be as effective as the amount of alterations and fine tuning made to it to suit a specific project or purpose. Design process models are not quick, sure fire formulae to ensure absolute design solutions. They are more heuristic than algorithmic, since the act of designing itself leans towards being heuristic than algorithmic.

Parts of the developed interior design process model were applied to a case study, the Center for Agricultural Research and Education (CARE). The major benefit of the process was that documentation of the design helped rationalize the decisions made in this project. Design is rational and can be documented.
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APPENDIX

Definitions

**Design:** A process that relies on creativity and intuition, as well as the judicious application of scientific principles, technical information, and experience, for the purpose of developing an artifact or an environment that will behave in a prescribed manner (Cross, 1984).

**Design Methods/Processes:** The design process or strategy can be expressed as a program or sequence of proposed techniques, each likely to generate the answer to a question and enabling the next question to be posed.

**Design Phases:** One or many more complete acts of thought that form an entire design process. In simpler terms the phases of a project can be likened to the intermediate stages that make up the entire process.

**Algorithm:** A routine or device for calculating. The algorithmic approach becomes more general in methodological procedures for design. The present day significance of the algorithm lies in its potential use in a computer program (Gregory, 1966).
Heuristic: Having to do with finding related to improving problem-solving performance, relying upon problem-solving devices which appear to be particularly relevant to the circumstances, and, if need be, devised for the occasion; a mode of procedure held to be necessary in the absence of algorithms. Heuristic procedures move from the use of known methods to novel methods. Creativity techniques are attempts to stimulate heuristic behavior (Gregory, 1966).

First Generation Design Methods: Methods and design processes that endeavor to apply mathematical models developed in operational research to design situations (Nutt, 1974).

Programming: A process leading to the statement of a design problem and the requirements to be met in offering a solution (Pena, 1977).

Program: Problem statement or problem definition.

Model: A representation of some past, present, or future object or event, used for communication or for dealing with problems. There may be a considerable degree of transformation between the representation and that which it represents (Gregory, 1966).
VITA

Vinitha Aliyar, daughter of Mr. P. Aliyar and Mrs. Kadeeja Aliyar, was born on August 28, 1965, in Coimbatore, India. In 1983 she graduated from PSGR Krishnammal Girls Higher Secondary School, Coimbatore. She was ranked among the top 50 students (out of more than 10,000 students) in the State Higher Secondary Board examination, held in April 1983. She then attended the School of Architecture and Planning, Anna University, Madras, India and in 1988 received a Bachelor's degree in Architecture.

In August 1988, the author entered the Graduate School of Virginia Polytechnic Institute and State University, Blacksburg, VA, in the Department of Housing, Interior Design and Resource Management where she pursued a Master's degree in Interior Design. She also held a Graduate Teaching Assistantship in Interior Design during this time.

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Future interests include a career in teaching and design related research.

Vinitha Aliyar

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DEVELOPMENT OF A MODEL OF THE INTERIOR DESIGN PROCESS

by

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Committee Chairperson: Dr. Nancy Canestaro
Housing, Interior Design and Resource Management

(ABSTRACT)

The purpose of this thesis was a) to review the design process literature in architecture and urban planning, b) to develop a model of the interior design process, and c) to apply parts of the model in a case study. The genesis and evolution of design processes in fields allied with interior design was traced. The review of literature established that interior design has little documentation of the design process. Much of what exists is borrowed from architecture and urban planning.

A model of one of the ways the interior design process could be rationalized was developed. The model was an adapted and altered version of different architectural and urban planning models. The changes were made to make the model more specific to interior design. The model was applied in a case study - the Center for Agricultural Research and Education (CARE), at Virginia Polytechnic
Institute and State University, Blacksburg, Virginia. Documentation of the interior design process included what if scenarios to rationalize interior design decisions taken in this project. The major limitation of this thesis was that the model could be applied only in one case study. Recommendations to increase the effectiveness of the model and possible ways of evaluating the model are given.