

PROGRAMMING IN
DESIGN

TERRY J. LEDESKY

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PROGRAMMING

IN

DESIGN

by

Terry J LeDesky

A thesis submitted in partial fulfillment
of the requirements for the degree

of

Bachelor of Arts

in

Architecture

MONTANA STATE UNIVERSITY
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I would like to dedicate this thesis to my wife and true friend, Laura.

PREFACE

My decision to become an architect no doubt resulted from my childhood desire to create. I have long admired those people who craft objects with their own hands. Some time has passed since I started my formal education in architecture. Previous to my enrollment in 1978, I gained experience in wood craftsmanship. This experience helped me acquire a value for the 'hands on' component in architecture.

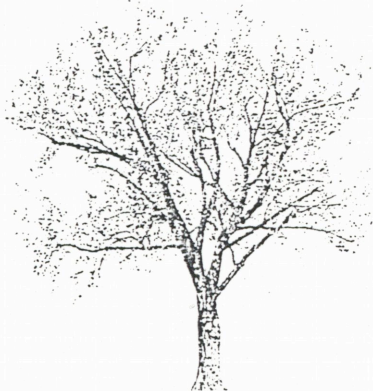
My formal education in architecture has taken two routes. The first was the predetermined route necessary for this degree, as required by the American Institute of Architects in fulfilling requirements for professional licensing. I consciously chose a second route in an attempt to fill in some of the gaps of the required curriculum. This second route included non-required classes such as Business Law, Engineering Economics, and a surveying course offered through Construction Engineering Technology. In addition to academic preparation, I have taken time to gain real-world architectural experience. A year of office experience expanded my awareness of other knowledge needed to succeed in the field of architecture. This additional knowledge needed in the field of architecture included areas such as business, finance, marketing, heavy construction, teamwork and the management of the whole design process.

Before completing this degree, I was able to travel in Western Europe for two months to gain other perspectives related to architecture. My travels exposed me to the cultural, social, political and economic influences that also affect our perception of architecture.

The thesis project chosen and presented herein will synthesize all my experiences in architecture. But also, and perhaps most importantly, I am challenging my weakest skill, writing. For it is communication in all forms that gives architecture definition.

I thank all the people that have given me their time, wisdom and direction. They have aided my continual development as an individual. I would like to acknowledge the assistance I received from Harold Nelson, my advisor. I also wish to thank my parents, Earl and Evelyn LeDesky, for their help over the years. And I would like to thank my wife, Laura, for all her help and support.

"The potential of a fruit tree is dependent on its pruner... A fruit without a vine will do nothing...Discipline nurtures the fruit."*



*Dr. Tyra Talley, Minister, First Presbyterian Church, Bozeman, Montana, sermon, May 5, 1985.

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Chapter 1

INTRODUCTION

The purpose of this thesis is to define programming and its role in the architectural design process. The intent is to provide the general client with a model for understanding the critical beginnings of the whole design process in which a client may be involved. Secondly, the thesis will introduce programming to students so they may defend the decisions they make in their design process. And finally, this thesis is intended as an aid to the practicing professional for identifying and resolving early critical decisions in the design process.

The concept of programming has developed into a comprehensive procedure in the past twenty-five years. (Palmer, 1981). Previously, an architectural program was simply a list of what a client wanted. The list included the number and sizes of pre-determined functional spaces, the number of occupants and their special requirements, a site plan and a desired budget for the project. The client was responsible for determining this information. The architect would simply accept this information and design a solution within given constraints.

Programming a client's information has steadily increased in the past twenty-five years. In 1969, the American Institute of Architects (A.I.A.) published their first document on programming techniques. (Evans, 1969).

This publication alerted architects to specific areas of growing concern in the business of architecture. These areas were communications, problem definition, hierarchy of problems, fact collection, and fees and services. Architects were cautioned to communicate their intentions clearly to a client. They were also encouraged to make a conscious effort to understand the client and user's desires.

Understanding the client and user's desires is necessary to define and prioritize the problems involved in the project. Without properly identifying all the problems, an architect is more likely to be remembered for what is omitted from a design rather than for what has been successfully addressed. Listing the hierarchy of a client's problems along with the needed design information made the architect accountable for this information.

A systemic approach for collecting facts is necessary for providing protection for the architect. A systematic approach establishes an a priori* plan for gathering complex data in an orderly manner. Programming for a wide variety of project types is addressed in A.I.A. Documents for compensation. Programming is compensated under the A.I.A. contractual Documents B141 or B161/B162. (Palmer, 1981). These A.I.A. Documents declare the owner responsible for

*a priori (L., "that which precedes," "from a, ab," from, "out of," and prior, "former," "before," "prior"). Prior to and independent of sense experience. (Angeles, 1981).

providing the architect with a program which includes owner's design objectives, design constraints, design criteria, space requirements and relationships, space flexibility and expandability, special equipment, systems: mechanical, electrical, plumbing and site requirements. A.I.A. Document 161/162 addresses one additional criteria which identifies the number and responsibilities of the personnel involved in the project. The architect is required to evaluate the project budget with respect to the given program checklist. If a client does not have this list of information, the architect may provide 'additional services' by providing an analysis of the owner's needs, and then program the listed requirements for the project if approved by the client.

The A.I.A. Document B161/162 (November 1977) expands the scope of additional services for attaining information regarding complex projects. Approval for these additional services are up to the client. Programming is categorized as one of these eight additional "pre-design" services. The eight services include: 1) programming, 2) space schematics/flow diagrams, 3) existing facilities surveys, 4) marketing studies, 5) economic feasibility studies, 6) project development scheduling, 7) project budgeting, and 8) special presentations. Further services are available under the label of site analysis which includes, 1) site analysis and selection, 2) site development planning, 3) on-site utility studies, 4) off-site utility

studies, 5) environmental studies and reports and 6) project budgeting for site-related work. These additional "pre-design" services address needed information when designing a 'complex' facility. Appendix A contains a breakdown of the "additional services" listed in the A.I.A. documents.

Edward T. White (1969) defined programming as a process that limits and directs planning. White stated at that time that programming was developing into a systematic, analytical discipline. The program should suggest design commitments and recommendations. According to White these recommendations are supported by background research that provides information which is unique to a specific project. The programmer or designer would produce a checklist of quantitative and qualitative facts from the background research. This list was based on the programmer's personal knowledge and available data on the building type. The checklist was categorized into traditional facts and non-traditional facts. Traditional facts included nine categories as follows: 1) similar projects and critical issues, 2) client, 3) financial, 4) building codes, 5) planning by related organizations, 6) function, 7) site, 8) climate, and 9) growth and change. Traditional information is readily available and quickly derived. Non-traditional facts are composed or developed by researching the hidden or remote relationship that would pertain to a specific project. Non-traditional facts contain the roles, effects and relationships of one thing to another. The "role of

physical environment in learning" would be an example of a important non-traditional fact used in designing a good school. Appendix B.1 and B.2 includes a list of White's traditional and non-traditional facts.

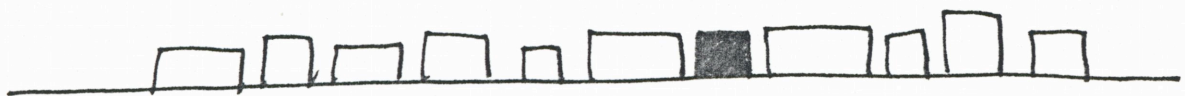
Once the checklists of traditional and non-traditional facts had been determined through background research, the data was gathered. Gathering data involved four steps as follows: 1) Procedures for gathering the data were planned. 2) The data that was to be collected was outlined for clarity. 3) Forms and formats were designed for recording and using data. 4) Sources for gathering data were defined and the procedure was executed. Appendix B also contains White's checklist of possible forms and sources.

The first step in executing the procedure is to establish procedural goals. White's first goal is to insure the gathering procedures and responsibilities are established for the participants. Secondly, a clear understanding is needed to insure there is no duplication of effort in gathering data. Lastly, all people, organizations, agencies that are affected by the project are to be involved.

At the administrative level, agreement on a programming process, ground rules and responsibilities are made. The various participant groups involved in the project are determined. One person from each participant group is to be the representative and decision maker for their group. All representatives are informed of the programming process,

their responsibilities, and the schedule of events. The researched checklists of facts are given to the representatives for verification or adjustment. After adjustments have been made programmers identify further needed data. Work sessions are then held with the representatives to determine information that is still needed. After this information has been processed it is returned to the representatives for verification and adjustments. Space requirements are tested with the budget. Adjustment is made to balance space and the budget.

After the data is gathered, an analysis and evaluation of the data is made for determining "precepts" and "concepts." Precepts are the individual planning commitments that deal with the architectural issues in the gathered facts. Precepts will direct the designer into an architectural form. Precepts will also be used to evaluate design alternatives. White uses quick sketches in recording and communicating precepts. Figure 1.1 shows how the important issues are emphasized in White's precepts.



*The community should feel
that it is their center.*

Figure 1.1 Type of sketch used by White.

Concepts are alternative planning directions that are suggested by the goals, facts and precepts. Once the most valid concepts are determined, programming is completed. A programming report is organized by compiling all these facts. Appendix B.5 contains White's checklist of report criteria. This program is then given to the client. According to White, the total programming process does not end until there has been a post-construction evaluation of the completed project. This evaluation is achieved by using the program. The construction evaluation is updated and used in future programming projects. Appendix B.6 includes an outline of White's programming process.

The architectural firm of Caudill Rowlett Scott (C.R.S.) from Houston, Texas has developed the most popular programming process used today (Pena, 1977). C.R.S. states that the scientific method is a systematic pursuit of knowledge and that programming is best done as a systematic search for information.

The programming process has five steps: 1) establish goals 2) collect and analyze facts 3) uncover and test concepts 4) determine needs 5) state the problem. Goals are what the client wants. Facts are the existing information used in attaining the goals. Concepts are the ideas that will accomplish the goals. Needs are the design constraints for attaining the goals. Problem statements are concise statements for directing the designer.

Programming "seeks" specific information needed in architectural design. Architectural design information is classified by C.R.S. into four major categories: function, form, economy and time. Function considers the people, their activities, and the relationships of those activities involved in the project. Form is a factor of the specific site within an environment that has a level of quality or uniqueness in character. Economy is defined as the financial commitment of the project. The financial commitment includes the initial budget, operating costs and life cycle costs. Time is analyzed as the past history, the present condition and the future of the design project.

To search information systematically, a framework is used to classify and document information. The framework is called the information index. The index is a matrix that the programmer prepares. The matrix is an organized listing of "provocative" words used to generate ideas from the client. Provocative words are abstract so that the decision maker(s) will respond with decisive ideas that can be recorded. The information index is composed of "provocative words" that are specifically aimed at each anticipated group that will be involved in the project. Figure 1.2 shows an example of the information index used by C.R.S.

DESIGN PROCESS

Information Index

Function	Goals	Facts	Concepts	Needs	Problem
People	Mission Maximum number Individual identity Interaction/privacy Hierarchy of values Security Progression Segregation Encounters Efficiency	Statistical data Area parameters Manpower/workloads User characteristics Community characteristics Value of loss Time-motion study Traffic analysis Behavioral patterns Space adequacy	Service grouping People grouping Activity grouping Priority Security controls Sequenced flow Separated flow Mixed flow Relationships	Space requirements Parking requirements Outdoor space Building efficiency Functional alternatives	Unique and important performance requirements which will shape building design
Activities					
Relationships					
Form	Site elements Itineraries, water, open space, existing facilities, utilities Efficient land use Neighbors Individuality Direction Entry Projected image Level of quality	Site analysis Climate analysis Code survey Soil analysis FAR and G.C. Surroundings Psychological implications	Enhancement Climate control Safety Special foundations Density Interdependence Home base Orientation Accessibility Character Quality control	Quality (costs sq. ft.) Environmental and site influences on cost	Major form considerations which will affect building design
Environment					
Quality					
Economy	Extent of funds Cost effectiveness Maximum return Return on investment Minimize operating costs Maintenance and operating costs Reduce life cycle costs	Cost parameters Maximum budget Time-use factors Market analysis Energy source costs Activities and climate factors Economic data	Cost control Efficient allocation Multi-function Merchandising Energy conservation Cost control Cost control	Cost estimate analysis Entry budget (if req.) Operating costs (if required) Life cycle costs (if required)	Attitude towards the initial budget and its influence on the fabric and geometry of the building
Initial Budget					
Operating Costs					
Life Cycle Costs					
Time	Historic preservation Static/dynamic Change Growth Occupancy date	Significance Space parameters Activities Projections Linear schedule	Adaptability Tailored loose fit Convertibility Expandability Concurrent scheduling	Phasing Escalation	Implications of change growth on long-range performance
Past					
Present					
Future					

PROVOCATIVE
WORDS

DESIGN CONSIDERATIONS

Figure 1.2 Information Index used by Caudill Rowlett Scott, Architects (Pena, 1977).

In implementing the C.R.S. programming process, the first step is to organize and staff the programming team according to the scale and type of project.

Cooperation with the various groups involved in the project is extremely important. To aid in this, a booklet introducing the programming process is assembled by the programmers. The programming team has to acquire acceptance by the whole client/user group for the successful completion of "squatters sessions." Squatter sessions are interviews held at the clients' office or locale for group interviews. These interviews are organized so that the programmers can use the prepared information index to attain information by discussing the provocative words. Information is recorded before and during the group interviews using two formats, "analysis cards" and "brown sheets." Analysis cards are 5" x 8" cards that are easy for the programmer to record and display on a wall for discussions. These cards relay simple statements using few words and a graphical sketch. An example is shown in Figure 1.3.

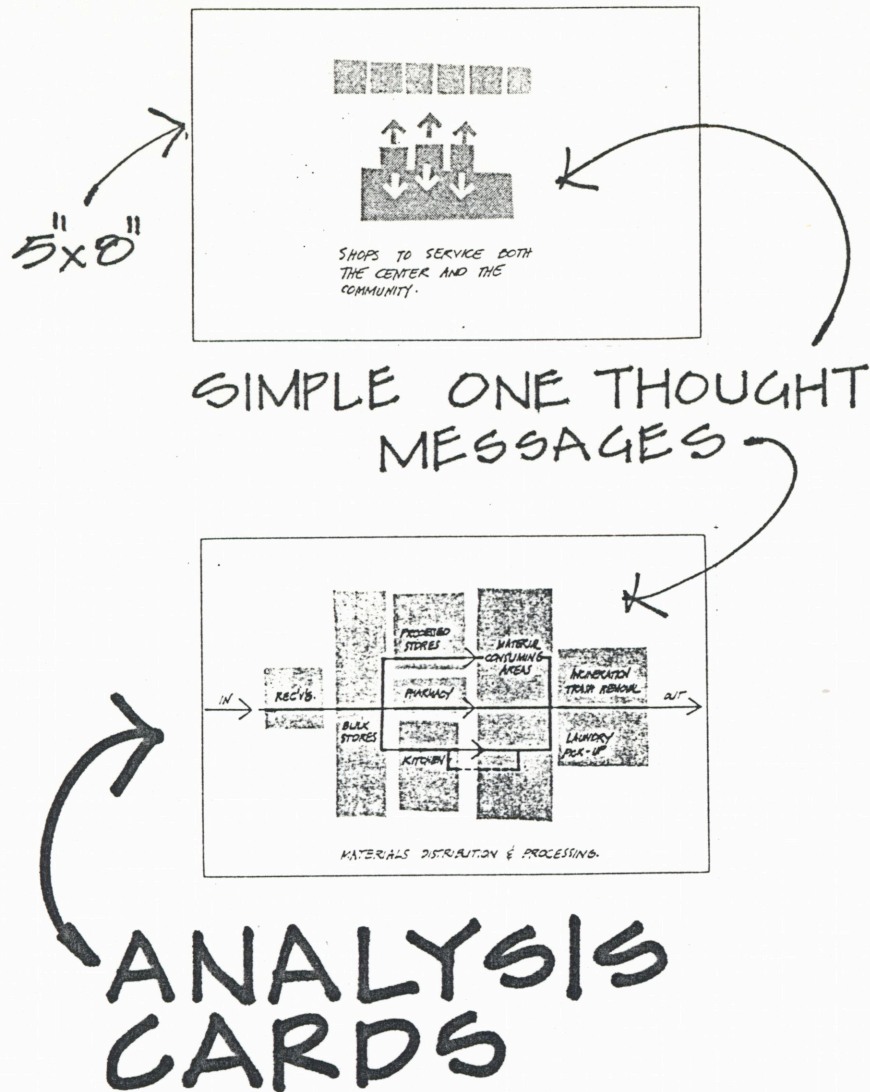
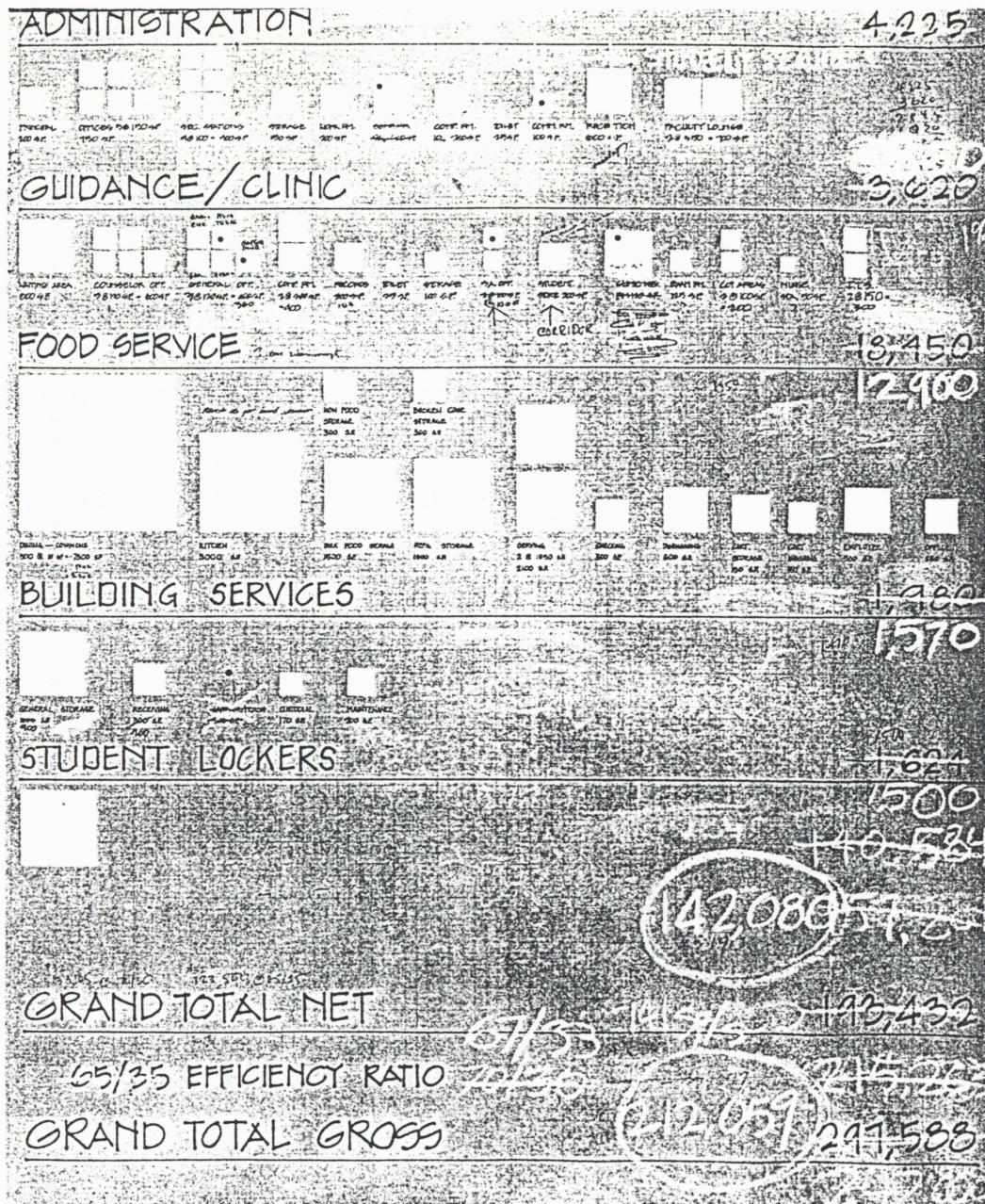


Figure 1.3 Analysis card used by C.R.S. (Pena, 1977).

Brown sheets are simple displays of the project space requirements in a 36" x 53" format. These sheets allow the viewers a quick sense of relative sizes of spaces that are being discussed. Along with each relative size, a monetary figure is determined for controlling the budget.

BROWN SHEETS



INFORMATION ADJUSTMENTS

Figure 1.4 Brown sheet used by C.R.S. (Pena, 1977).

After the interviews are complete, the collected data is evaluated by following the five steps in the programming process. The client's goals are established. Facts and concepts are evaluated according to how useful the information is in achieving the goals. Needs determine the 'quantity' and 'quality' requirements of the project. The final programming step of stating the problem is seen by C.R.S. as the first step in schematic design. The problem statements, as well as revised analysis cards and brown sheets are prepared and presented to the client as a programming report. Appendix A contains an outline of a C.R.S. programming report. Appendix B contains an example of C.R.S. programming procedures.

Other architects have stated different characteristics of programming.

Programming is assembling of aids into a strategy based from the social, behavioral and management sciences in order to build upon other disciplines also.

The program is the systematic recording of the events along a selected course. (Sanoff, 1977).

Programming is the process that elicits and systematically translates the mission and objectives of an organization, group, or individual person into activity-personnel-equipment relationships, thereby resulting in the functional program. (Preiser, 1978).

In 1981 the American Institute of Architects published a sociologist's research on programming:

Programming has emerged as a systematic process for investigating and analyzing the design requirement of a facility. (Palmer, 1981).

In the past fifteen years, programmers have addressed

the needed characteristic for being a 'systematic' process involving information used in design.

According to C. West Churchman (1979), a system is purpose oriented in achieving goals and is made up of five major parts: 1) objectives, 2) environment, 3) resources, 4) components, and 5) a management.

A whole system has objectives. These are what Churchman calls "performance measures." These are precise statements which are based on a 'value' having an underlying reward motive (i.e. the mission, purpose, or goals). An example of an objective in programming would be to collect all pertinent information for a design project. Figure 1.5 illustrates the whole system of objectives as perceived by Churchman.

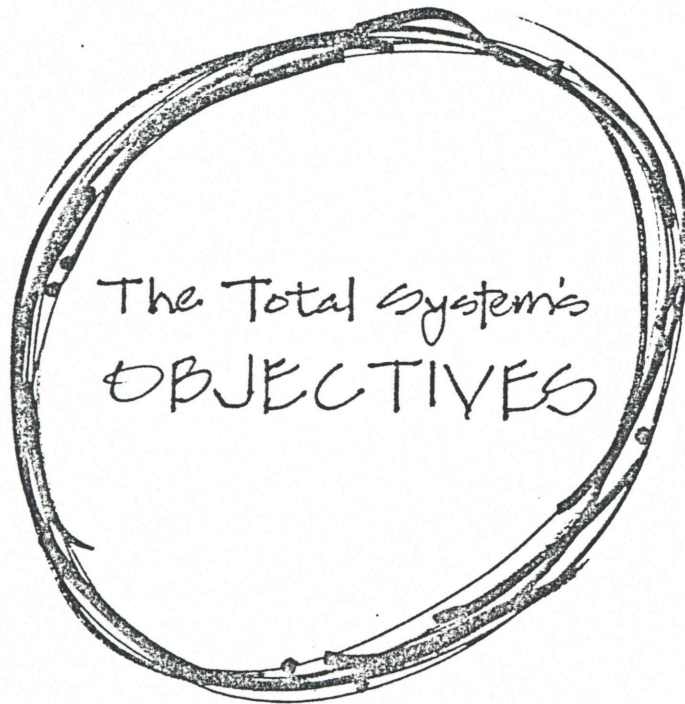


Figure 1.5 The whole system of objectives as perceived by Churchman.

The environment of the system is defined by fixed constraints. These constraints are beyond the system's ability to control. Some programming examples of constraints beyond the control of a system could be the given site, unattainable data, time limitations, and the inability to control public acceptance of a project. As a result of the environment, a 'requirement schedule' is needed for a system to work or run. Figure 1.6 conceptually illustrates how a system is related to its environment.

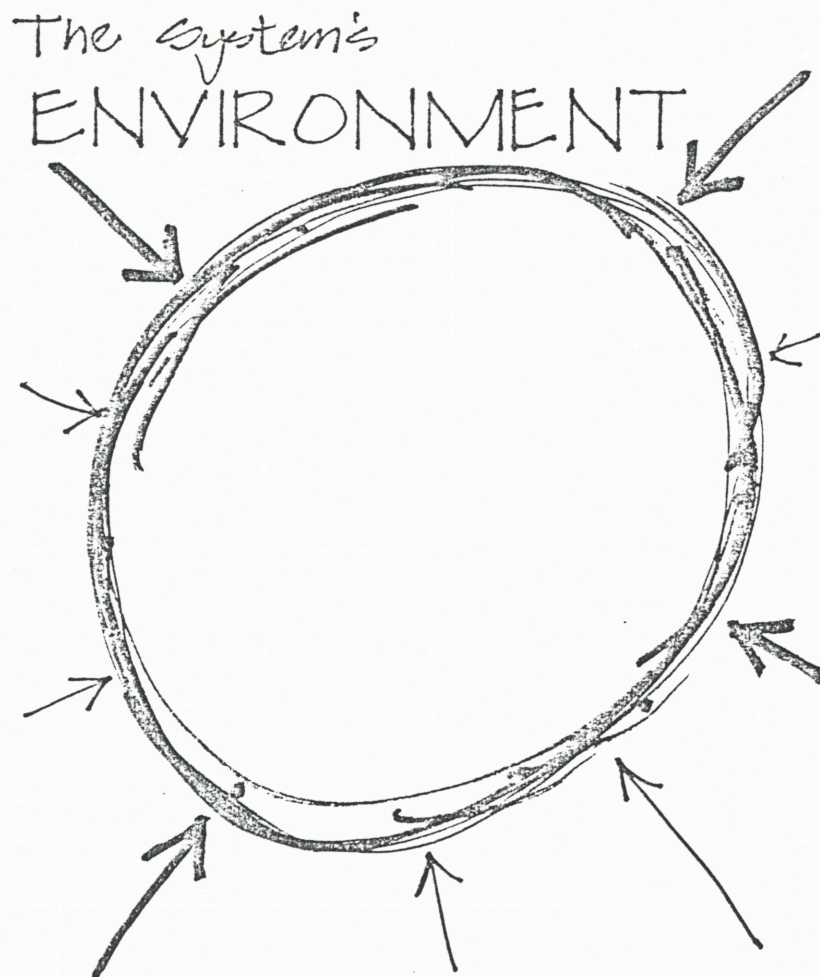


Figure 1.6 The environment of the system as outlined by Churchman.

The third major part of the system are the resources that enter and exit the system. Resources are used for the system's benefit in meeting the whole system's objectives. Examples of resource inputs required to meet project objectives are money, workers, equipment, information and time. Figure 1.7 illustrates a schematic diagram of resources used by a system.

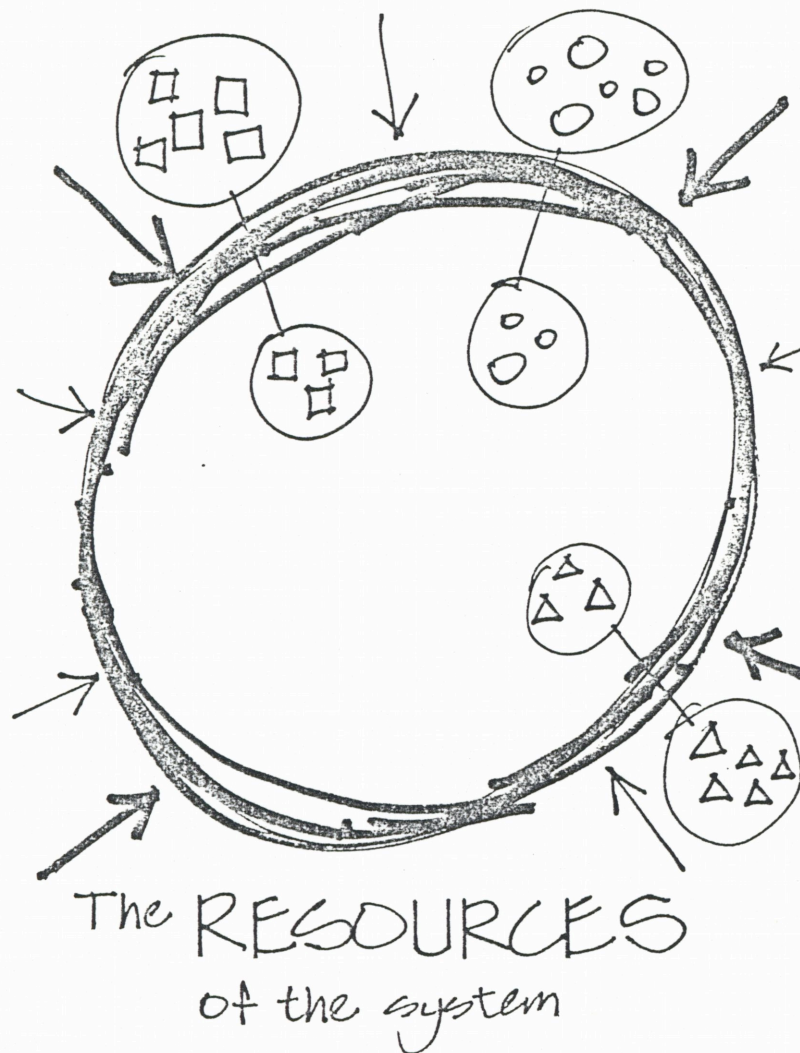


Figure 1.7 Schematic diagram of resources used by a system.
(Churchman, 1979).

The fourth part of a system includes the components of a system. These components are the activities that are performed in the system. These activities are evaluated relative to the whole system's objectives and must be adjustable. Some examples of system components in programming include gathering data, conducting interviews, and writing programming reports. Figure 1.8 shows a schematic diagram of activities performed in a system.

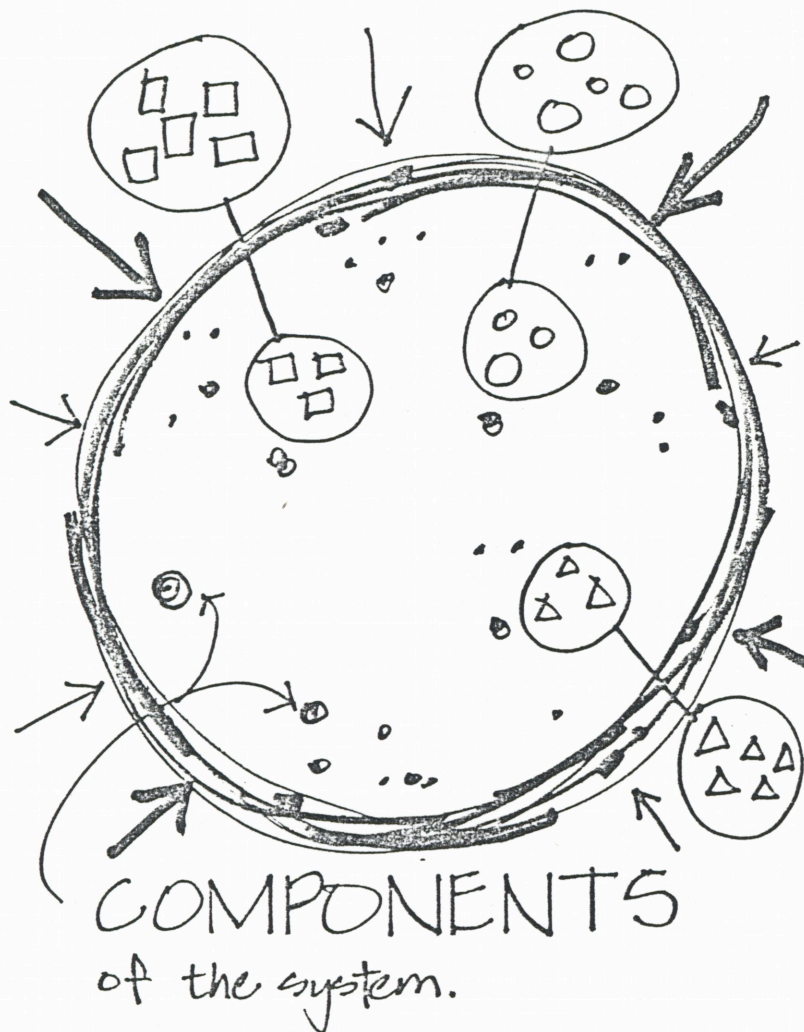


Figure 1.8 Schematic diagram of activities performed in a system.

Lastly, management is the structure from which decisions are made that produce change in the system. An example of management is the 'chain of command' including executives, department head, workers and others who must perform specific tasks in order to complete components of a project. Figure 1.9 outlines a schematic diagram of a system.

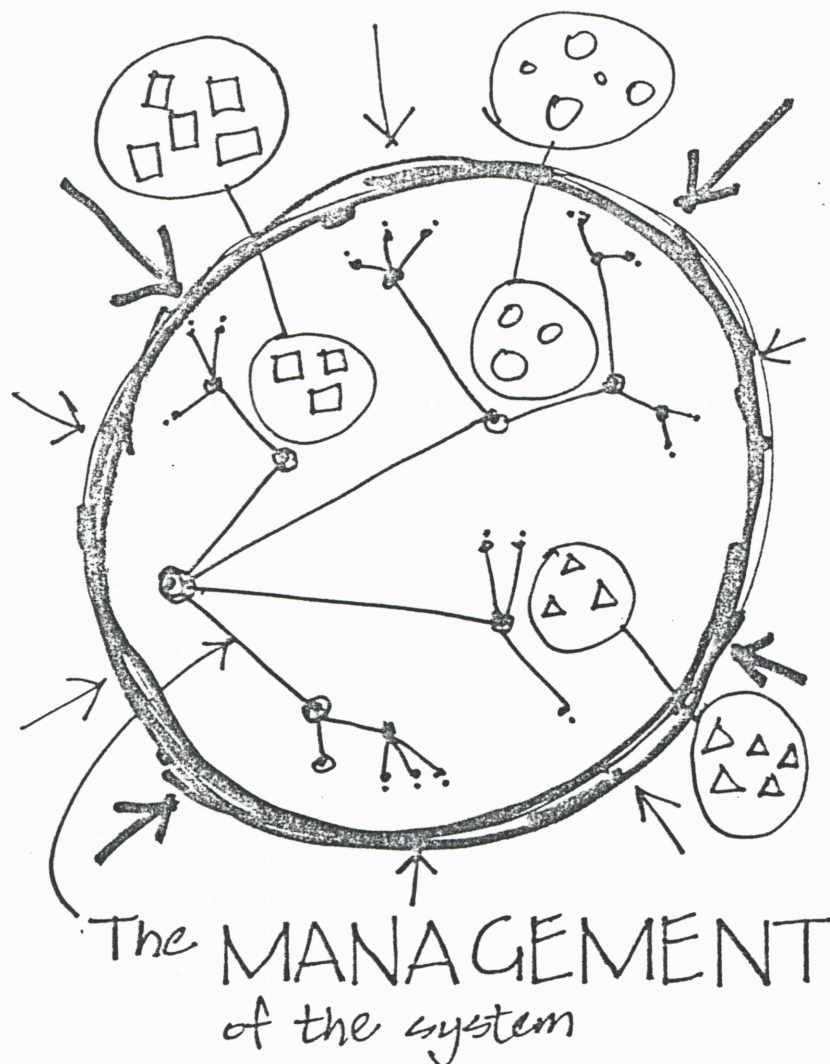


Figure 1.9 Schematic diagram of system management as outlined by Churchman.

The five parts of a system are all present in the architectural design. Each design project has objectives that are definable in specific statements. White and C.R.S. established the client's goals as the performance measures for design requirements. The environment of fixed constraints in design are due to many outside sources as White's checklist of information sources have shown in Appendix B.3. Design resources is a client with architectural objectives and information as discussed earlier in the AIA Documents. Management of the whole design process, as seen with White and C.R.S. can have different strategies to create change. Design is a system.

According to Churchman a system is never a single entity. A system is inter-related with other systems. Each system is contained in a larger more complex system. Architectural design as a system contains smaller, inter-related systems such as programming, schematic design and design development. This inter-relationship is easy to misunderstand because of the several semantic meanings of the word 'design.' Figure 1.10 shows the architectural design system.

ARCHITECTURAL DESIGN

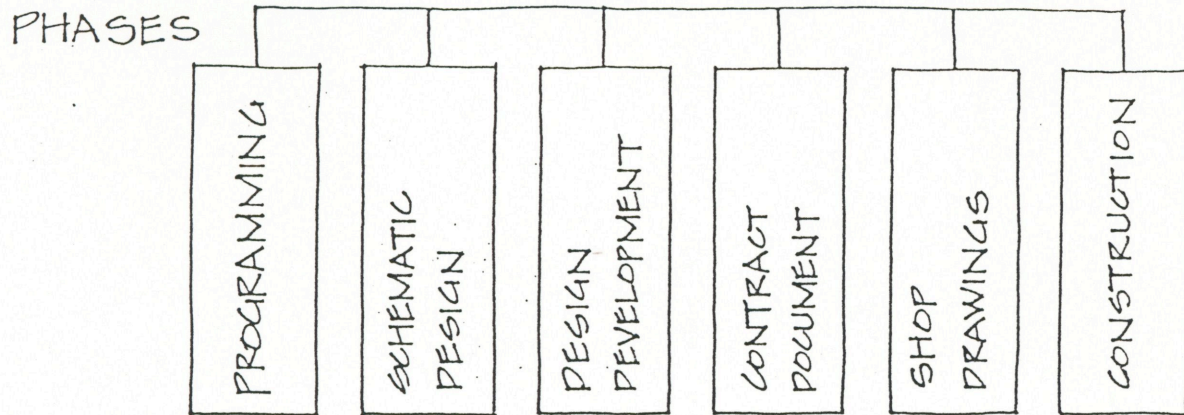


Figure 1.10 The architectural design system.

Likewise, the whole architectural design system is one of other systems such as engineering design, industrial design in the larger system called design. Figure 1.11 illustrates these smaller systems that are within the larger system of design.

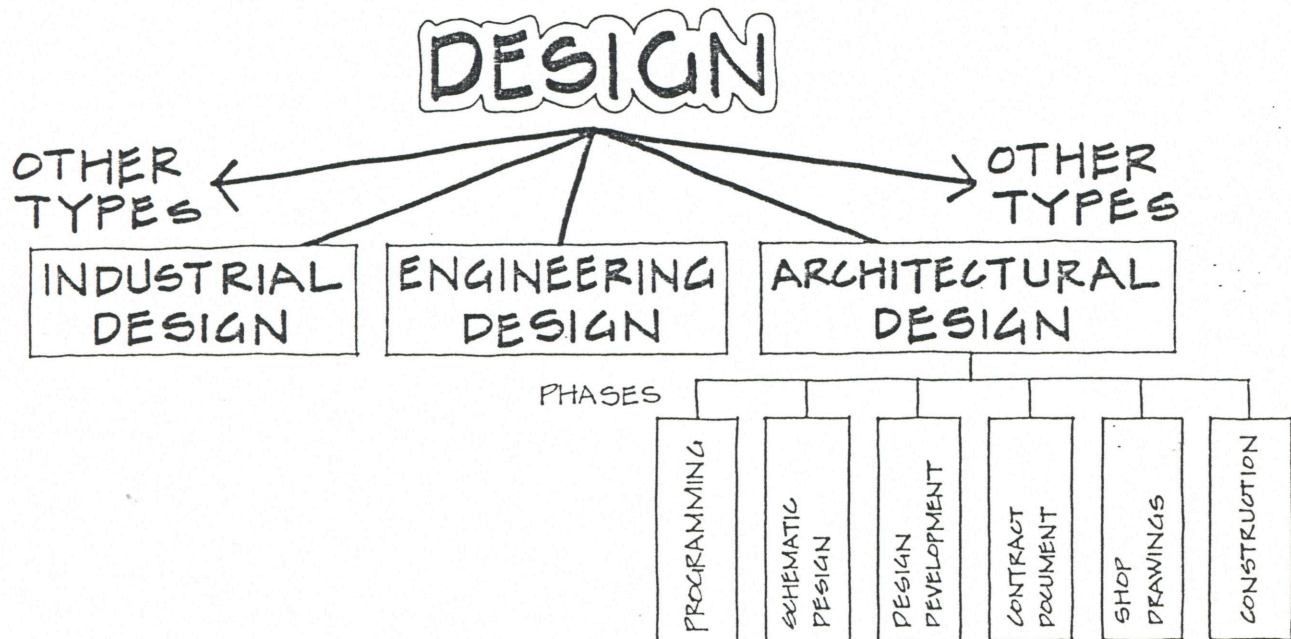


Figure 1.11 The larger system called design.

Christopher Alexander (1977, 1979) has developed a design process based on the principles of inter-relating systems. Alexander presents an argument based on social observations of repeated characteristics around the world. These repeated characteristics are called "patterns." Alexander compiles a 'dictionary type' program where 253 patterns are defined. Patterns are categorized by their physical size. Alexander's largest pattern is labeled "independent regions" and the smallest pattern is labeled, "things from your life." The list of patterns are identified by Alexander as a 'language.'* Alexander's book A Pattern Language (1977) is a self-guided programming process. The reader may develop a program by selecting desired patterns from the checklist at the beginning of the book. Once this list is established, the reader is directed by page number to the description of each selected pattern. Each pattern description defines both the larger and smaller inter-related patterns. The larger pattern defines the context of the reader's project. The smaller inter-related patterns are what Alexander calls the embellishment which aids in creating a 'living' place. (Alexander, 1979). Alexander writes in a romantic and captivating style which is perhaps more amusing than useful. Appendix D.1 has an example list of "patterns." Figure 1.12 illustrates the

*language (L., lingua, "tongue.") 1. That body of symbols, their standardized meaning and the forms of expressing those symbols used as a method of communication. 2. Any means of expressing the contents of consciousness (feelings, emotions, desires, thoughts) in a consistent pattern of meaning. (Angeles, 1981).

concept of Alexander's pattern relationships.

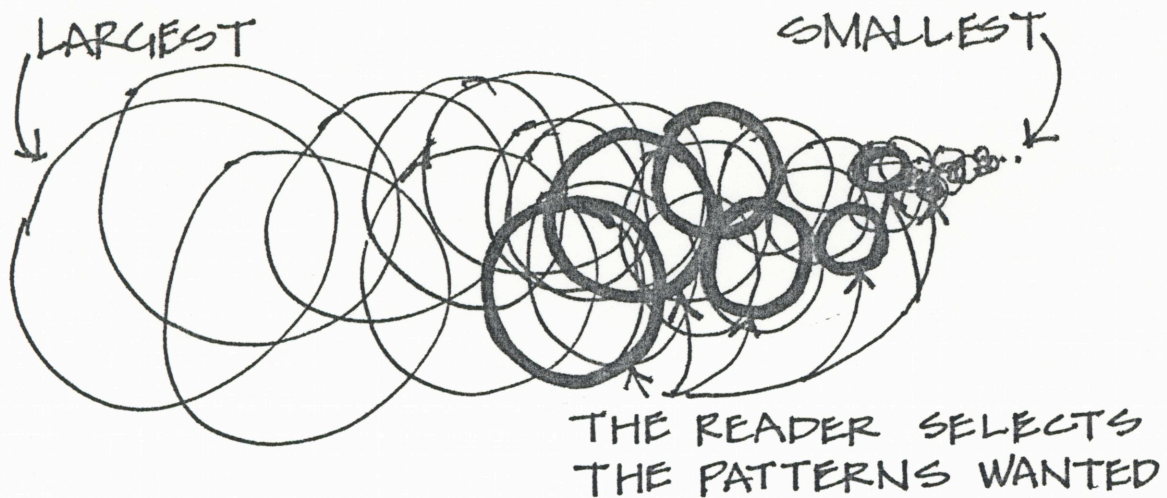


Figure 1.12 Alexander's pattern relationships.

Alexander's A Pattern Language is not a total programming process since it does not address quantities such as the readers' financial requirements or the square footages in space requirements. It is however, a method for identifying and planning qualities that a client may want.

A planning system according to Churchman (1979) contains three major subsystems: social interaction, measurement and testing.

Social interaction is an ongoing relationship between the planning system and all decision makers. Subprograms in social interaction include: justification, organization, communication, and implementation.

Justification evaluates why the planning system exists and it's proper role. The measure of performance is cooperation in designing and implementing that design.

The organization establishes the staff and their responsibilities and range of authority in the planning

system. The measure of performance would be a high awareness of accountability and an established role of each individual in the planning process.

Communication entails three subsystems: 1) persuasion, 2) education, and 3) politics. Persuasion takes place when the planners are convinced their plan is correct. The objective for this would be acceptance.

Education occurs when understanding of the plan causes it to be adopted. The objective of education is to gain knowledge. Politics is whereby group power produces change in a social order. The measure of performance of politics is social adoption. The objective for the communication subsystem is a concise information exchange which acquires a desired response.

Implementation is establishing the process needed to achieve the plan. The measure of performance is the net savings in resources.

SOCIAL INTERACTION:

THE ONGOING RELATIONSHIP BETWEEN THE PLANNING SYSTEM (PS) AND THE DECISION MAKER(S).

SUBPROGRAMS:

■ **JUSTIFICATION** : WHY THE PS SHOULD EXIST AND ITS PROPER ROLE.

■ **ORGANIZING**

STAFFING THE PS AND ESTABLISHING ITS RESPONSIBILITY AND AUTHORITY.

■ **COMMUNICATION**

■ **PERSUASION** : "SELLING" THE PLAN.

■ **MUTUAL EDUCATION** : TEACH THE PLAN ABOUT THE LARGER SYSTEM, AND TEACH THE LARGER SYSTEM ABOUT THE PLAN.

■ **POLITICS** : IDENTIFY AND CHANGING THE POWER STRUCTURE OF THE ORGANIZATION.

■ **IMPLEMENTATION** : INSTALLING THE PLAN.

Figure 1.13 Social interaction subsystem.

The measurement subsystem are the activities within the planning system in which information is created. Churchman mentions that this is where most processes fail. This area must receive special care for any accuracy in planning.

Measurement includes six activities: 1) decision making, 2)

alternatives, 3) goals, 4) objectives, 5) effectiveness and 6) optimization.

Decision makers are those people that can produce change in their system. The measure of performance for decision making is the net benefit of change.

Alternatives are those actions that create a desired change in the whole system. The measure of performance for alternatives is the net benefit of performance. Produced alternatives must satisfy the whole system's objectives. One objective for the whole system is the conservation of resources per activity in the system.

Goals defined by Churchman are short-ranged objectives. They are specific and unique to each stage throughout the whole planning process. A measure of performance for goals would be a low net utilization of resources per desired achievement.

Objectives are long-ranged. Objectives organize the goals into a hierarchy of sequential stages. Due to the speculative nature of objectives, flexibility for adjustment is important when new pertinent information is acquired. A measure of performance for objectives would be to establish high levels of prediction and response in the system.

According to Churchman effectiveness is measured in two specific activities. First, there is a measuring of the effectiveness of each alternative course of action with each stage of goals. Second, there is a measuring of the effectiveness of each goal stage with the ultimate long term

objectives. The measure of performance for effectiveness would be a high level of satisfaction throughout the system.

The last of Churchman's activities in the subsystem of measurement is to optimize the system by predicting the ultimate alternative. This would be an ideal alternative such as striving for an ideal efficiency level. The measure of performance for the whole measurement subsystem in a planning system would be a high quantity of relevant information for producing rational decisions. Figure 1.14 shows the list of activities in the measuring subsystem.

MEASUREMENT : IDENTIFICATION, CLASSIFICATION, PREDICTION, ETC.

DECISIONMAKER(S) : IDENTIFY THE DECISIONMAKER(S) AND "CUSTOMERS" OF THE LARGER SYSTEM.

ALTERNATIVES : DISCOVER AND INVENT THE ALTERNATIVES.

GOALS : IDENTIFY FIRST STAGE GOALS.

OBJECTIVES : IDENTIFY THE ULTIMATE OBJECTIVES.

EFFECTIVENESS

ALTERNATIVE : MEASURE THE EFFECTIVENESS OF EACH ALTERNATIVE FOR EACH FIRST-STAGE GOAL (DESCRIBE THE LINKAGE).

GOALS : MEASURE THE EFFECTIVENESS OF EACH FIRST-STAGE GOAL FOR THE ULTIMATE OBJECTIVES (LINKS).

OPTIMAL : ESTIMATE THE OPTIMAL ALTERNATIVE.

Figure 1.14 Measuring subsystem.

The testing subsystem according to Churchman, overlaps the measurement subsystem. This is because the overall objective for testing is to improve the accuracies in the measurement subsystem. Testing includes three activities:

1) simulation, 2) counterplanning and 3) control.

Simulation is accomplished through modeling. Models are a tool for understanding. Modeling is a method which has many possible objectives and forms which require certain abilities of understanding (Broadbent, 1973).

Figure 1.15 shows a possible range of models.

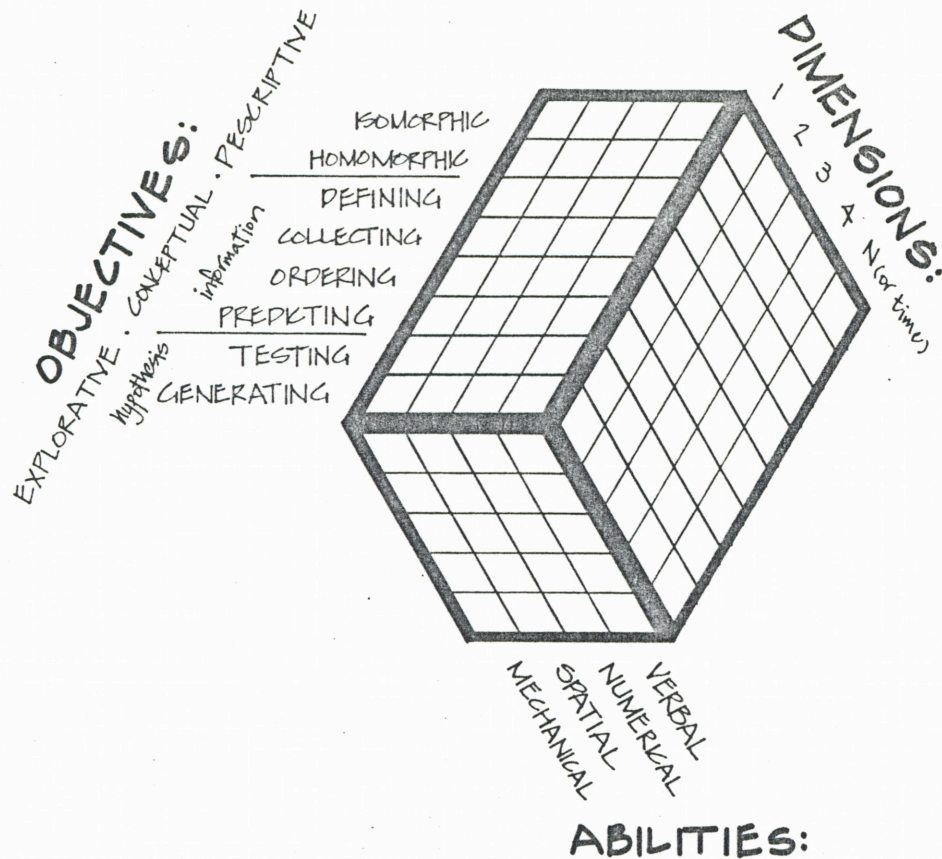


Figure 1.15 A classification of models. (Broadbent, 1973).

The objective of modeling is to acquire understanding for decision making.

Counterplanning looks at possible areas of failure in the planning system. Some possible failures are unclear objective statements- stating one thing but doing another,

establishing a wrong sequence of goal stages, misjudging alternatives, and misunderstanding constraints. The measure of performance for counterplanning is a high level of net benefit per decision made.

Once the plan is implemented the final testing activity is controlling the system. Management, information and time are the three major components used in controlling. Information is researched and evaluated by the management. Time is required in evaluating the alternative actions according to the goals and objectives. Decisions are then made to select the best alternative action in the system.

Cybernetics is a method used in testing the management's decision making ability by creating negative or incorrect information. Corrective alternatives are then developed by the management so that they may choose a beneficial change in the system. Figure 1.16 outlines the testing subsystem according to Churchman.



Figure 1.16 Testing subsystem.

Figure 1.17 shows that throughout the planning system there is continuous decision making. A decision maker(s) chooses among alternative actions in order to achieve a sequence of stage goals that achieve wholistic objectives.

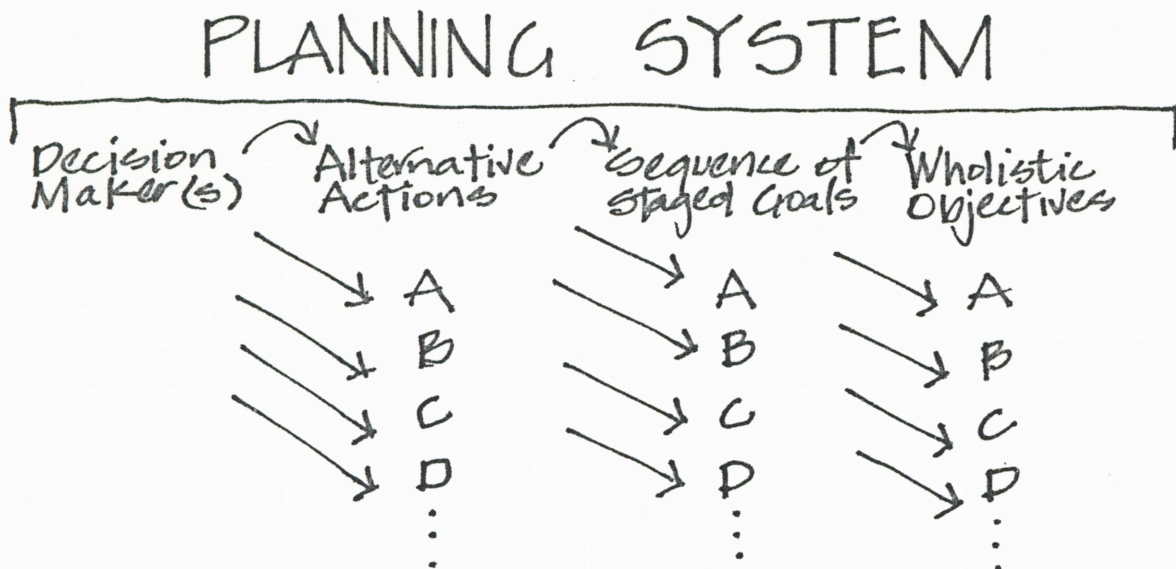


Figure 1.17 A model of a planning system's continuous decision making.

The architectural profession has become a part of "an information society" (Naisbitt, 1984). The vast quantity of information has increased the possibility of misunderstanding the intentions and responsibilities between client and architect. The A.I.A. documents have expanded the definition of 'additional services' which allows flexibility in the scope of a project. This flexibility requires each architect to interpret for the client what ought to be done. Programming is the initial planning phase in which an architect must explain why this flexibility exists.

According to sociologist Mickey Palmer (1981) programming has shifted away from the end product of a 'program' to an emphasis in the process of developing information. Three trends in programming are evident today.

- 1) Programming is becoming more accepted as a predesign activity for the purpose of managing data, planning administration and clearly defining a project's needs.
- 2) Programming is becoming a distinct process in design. This process is amplified by the association of processing information. Because of this, programming has activities throughout the total architectural design process.
- 3) Programming has developed into such a marketable specialty that many large institutions have in-house staff for information processing and decision making. Through specialization, programs have been developed in many areas. Appendix E.1 lists 40 types of programs.

Programming design information as stated by many previous sources, 'ought to be' systematic. Churchman has defined the essential components of a system. This philosophy of a planning system is the foundation by which this thesis will develop further understanding of programming in design.

CHAPTER 2

PROGRAMMING: A PARADIGM FOR STUDENTS AND THE PROFESSIONAL

The design process is more inclusive than what a body of professionals have stated as being clearly analysis and synthesis. (Koberg, 1977; Ledewitz, 1985; Pena, 1977).

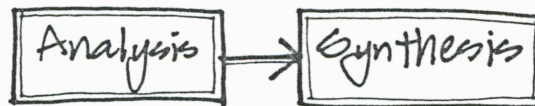


Figure 2.1 A model of the design process.

Two repeated characteristics of mankind throughout history have been his abilities for abstraction and generalization (Norberg-Schultz, 1975). Analysis and synthesis are both examples of abstraction and generalization.

Analysis and Synthesis

ANALYSIS (GK., analysis, from analyein. "To loose," from ana, "up" and lyein, "to loosen," "to untie").

1. The mental (or actual) separation of something (a whole, an entity, a problem) into its parts in order to study:
 - a. the parts separately,
 - b. their interrelationships,
 - c. how they relate to the whole.
2. The process of attempting to uncover the implicit meanings and presuppositions of a system of beliefs or of a statement. (Angeles, 1981).

After examining the definition above, it is not clear as to whether this "something" is physical or metaphysical. Analysis is, however, aim-oriented at this undefined "something." Analysis is primarily a description of a stepping process of inquiry. Figure 2.2 shows a model of the stepping process of analysis.

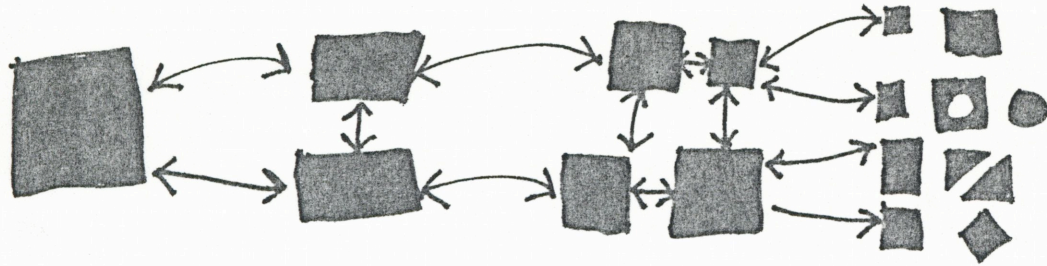


Figure 2.2 A model of the stepping process of analysis.

SYNTHESIS (GK., synthesis, "a putting together," a composition, "a combination," from syn, "with," and tithenai, "to place").

1. The bringing together of ideas or differing ideologies into a whole.
2. The result of 1.
3. The combining of things (ideas, concepts, qualities) into more complex wholes from simpler things.
4. The result of 3. (Angeles, 1981)

By definition, synthesis is a stepping process as well as the consequence. Synthesis is building a result which is a "whole" as shown in Figure 2.3.

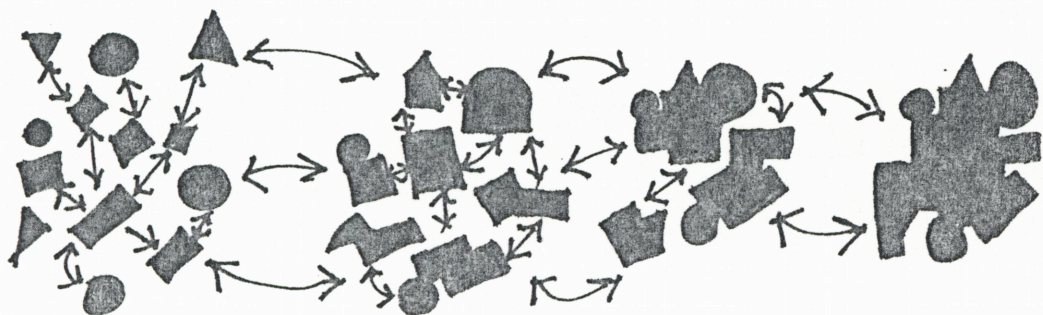


Figure 2.3 Model of the stepping process and the result-synthesis.

Analysis and synthesis describe an abstract and generalized process. One step of analysis is to take "something" apart to see the interrelationships of the parts. The other step is an inquiry into how the parts relate to the whole synthesis. By understanding the meaning of analysis and synthesis, individually, a question of which came first is inevitable as Figure 2.4 displays.

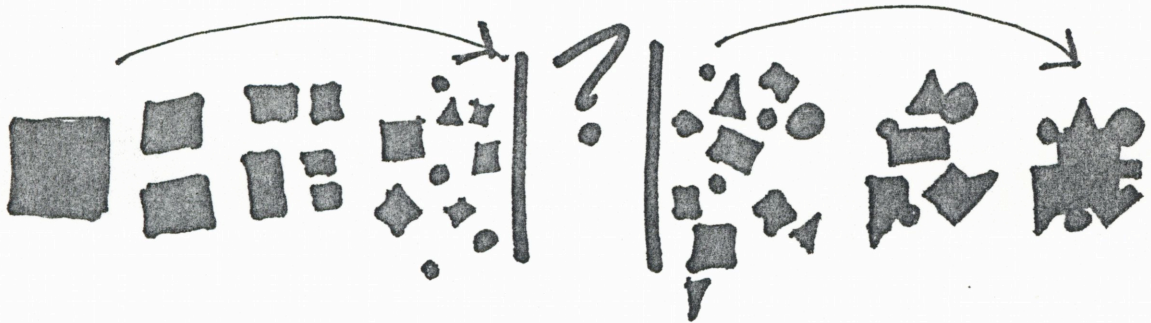


Figure 2.4 Model of limited understanding.

By definition, analysis and synthesis as a two step design process, is too abstract and generalized for any comprehension by many clients, students and professionals. The design process is not clearly analysis and synthesis as shown in Figure 2.5.

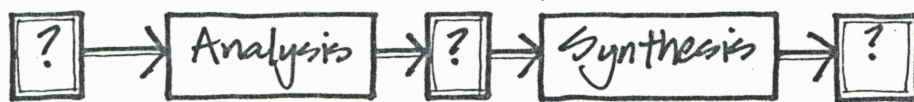


Figure 2.5 Model of understanding the analysis and synthesis process.

Process, Steps, Methods and Techniques

To insure a common understanding definitions of process, stages, steps, methods, techniques and tools will follow.

Simply put, a process is a change of changes. A process is one of a sequential arrangement of stages and steps that are in a logical order to achieve a long-term objective (Koberg, 1979). Stages are static labels. Steps are the dynamic action that are instrumental in gaining knowledge for the next stage. A model of sequential stages and steps are shown in Figure 2.6.

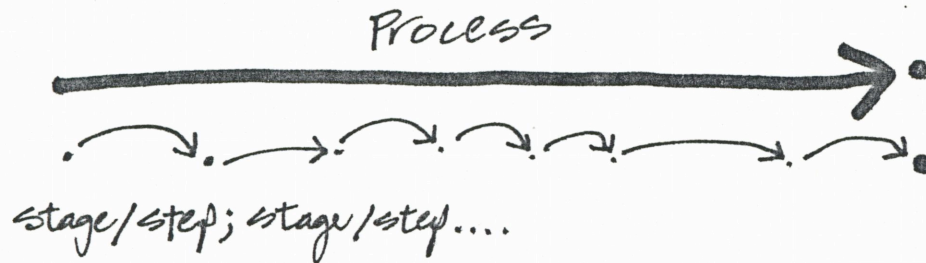


Figure 2.6 Process is a change of changes.

A design process converts chaotic data regarding both physical and nonphysical objects into an order by rational means. A rational process is 'change' that is carried out in a logical order. Results of a prior step are used as a transition into the next step. This approach results in an succession of steps rather than each being a separate entity.

A step is a directed change in a process, identified by the step's objectives. Both analysis and synthesis are

nested processes. Analysis and synthesis, each as a step, produced change within themselves. One step did not contain part of next, therefore, both were nested processes.

Each step in a planning process is attained by using one or more methods. In the step of analysis, for example, the parts should be examined to discover available methods to attain the objective of separation. As Churchman's planning system has shown, alternatives are those methods that are common in performing a first stage goal. Methods that achieve the first stage goal as a prerequisite for entering the next step in the process are the most desired.

Techniques are the ways a method can be accomplished. There are alternative techniques to choose from for each method. Acceptable techniques are evaluated by the objectives of the method using the techniques.

In a body of viable methods each method may have a measure of a probable outcome. Probability is a mathematical measurement (Broadbent, 1983). Probability equals the quotient of the number of times the same outcome occurred in the past divided by the total number of attempts. This method of defining probability may be used to evaluate alternatives, and can help to understand the comparative benefits and costs of two different alternatives if they are quantitatively measurable. Thus, probability or other mathematical techniques may be used throughout a quantitative method as shown in Figure 2.7.

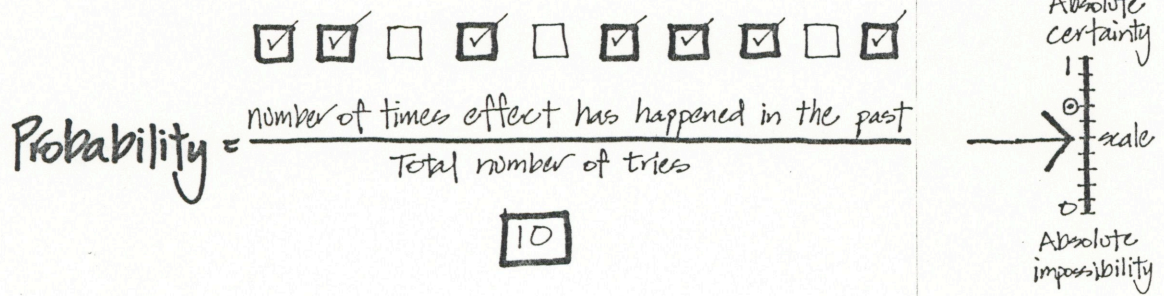


Figure 2.7 Probability and a decision making scale.

Tools are used in different techniques to accomplish a method. A scale was the tool to represent probability in defining the mathematical probability of a quantitative method. An example of this is shown in Figure 2.7. Charts and matrix are examples of tools.

Christopher Jones (1970) organized a design process using a framework technique. The sequential steps in Jones's design strategy organized a range of alternative methods for attaining the next stage in the design process.

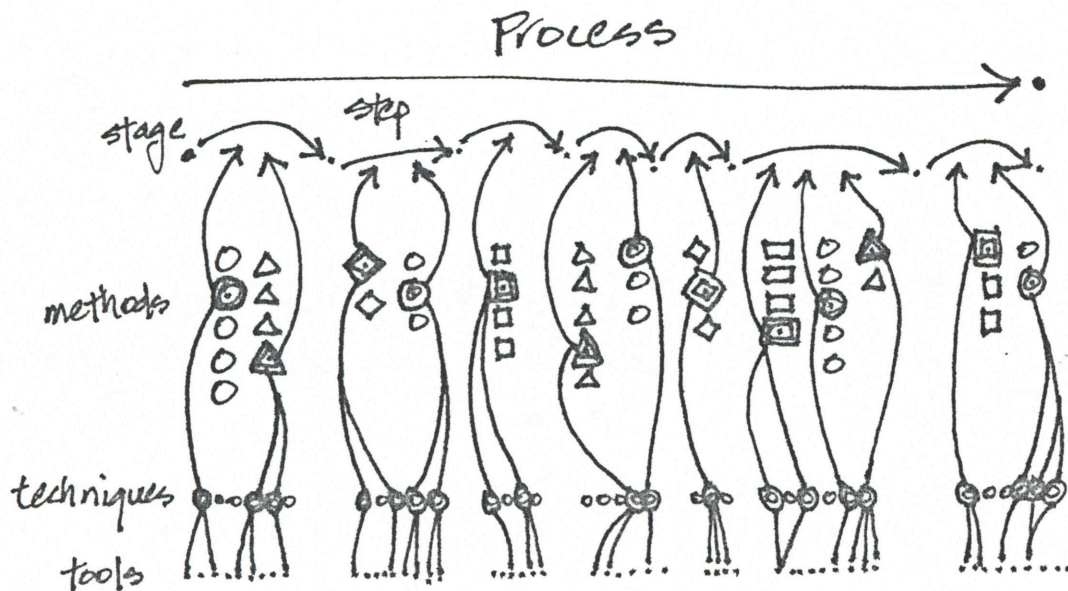


Figure 2.8 Model showing the relationships in planning a strategy.

In summary, process is the whole sequence of steps and stages that are goal-oriented, aimed toward long-term objectives. The individual steps are composed of a method or methods available to accomplish a short-term goal. Objectives are long-term and goals are short term in definition. Techniques are the means by which methods are achieved. Due to the relationship between steps, methods and techniques there is mathematically, many possible combinations available. Decision making is required in determining the most probable combinations of steps and methods for best achieving goals and objectives.

Decision Making

Decision making throughout planning is an important activity due to the frequency and 'change' that result from each effort to achieve an objective. Figure 2.9 models the basic sequence of decision making using the measurement activities from Churchman's planning system.

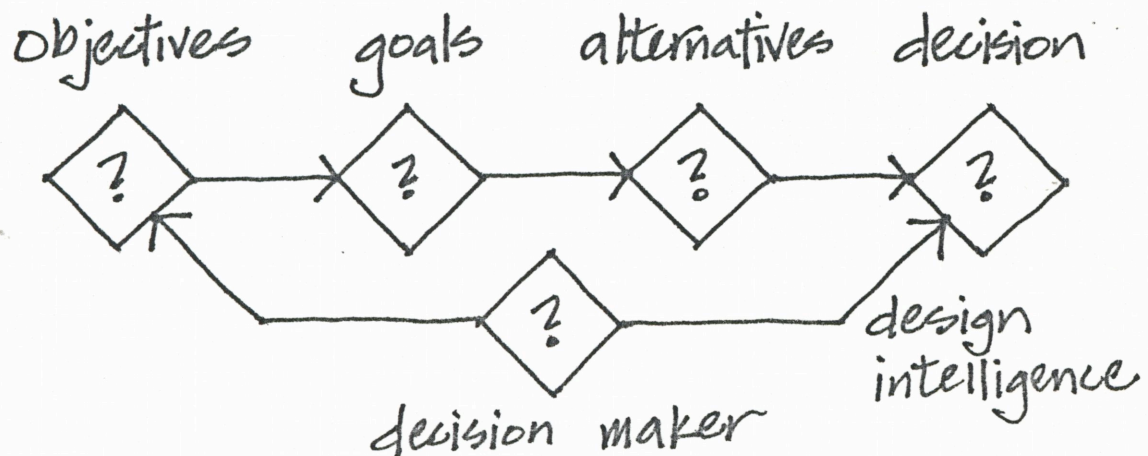


Figure 2.9 Model of the structure of decision making.

Once the objectives are defined, the decision maker begins a process of inquiry in each stage of the objective aim-oriented process. The decisions which are made in one step are instrumental in defining the environment for the next step.

Short-term goals are defined to accomplish the long-term objectives. The order in the nature of inquiry is guided by the valued decisions. Rational decision making is required in determining the best possible combinations of stages, steps, methods and techniques for successful allocation of resources required in attaining the objectives. An understanding of constraints and resources are required before any alternatives choices ought to be considered. Once a decision is made, feedback is returned to the decision maker. This single step of feedback in the decision making structure is the sign of intelligence. The act of deciding is a trial and error process that is non-rational intelligence. Feedback establishes a posteriori* rational intelligence.

Decision making in programming is a three way conversation. Figure 2.10 shows a model of the social relationship of programming.

*(L. "that which follows after," from a, ab, "from." "out of," and posteriori, "latter"). After or coming from sense experience. Opposite to a priori. (Angeles, 1981).

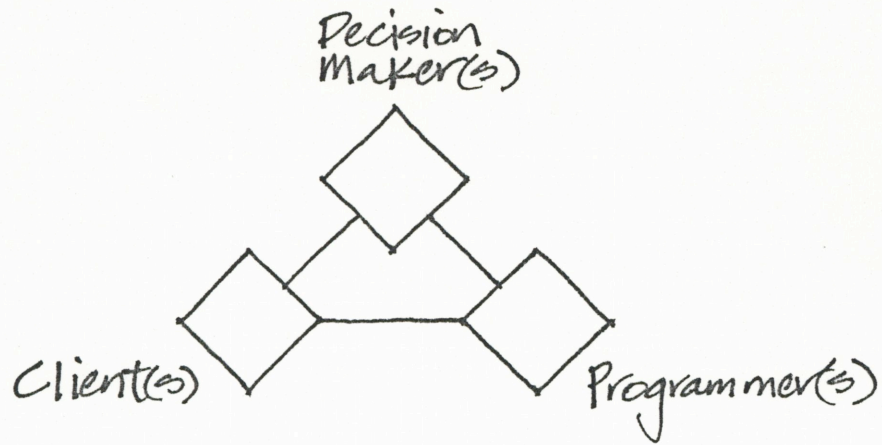


Figure 2.10 Model of the social relationship of programming.

Roles must be understood for acquiring the best information available. Information sources must be identified to insure the effectiveness of programming. Four social relationships of programming information sources are shown in Figure 2.11. The first source is the actual decision maker that has decided to pursue an objective. The second relationship of information sources are when the decision maker decides on specific help such as a programmer as seen in Figure 2.11 (b). The third source of information comes as a result of a decision for considering the unrepresented client of the objectives as shown in Figure 2.11 (c). The life of the client will be affected by the changes produced by the decision maker. The client 'ought to' determine the purpose and pleasure of the objective.



Figure 2.11 (a) Decision maker.

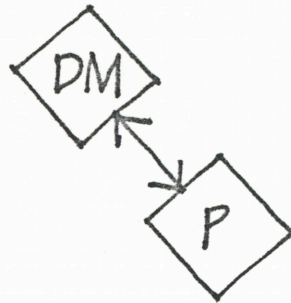


Figure 2.11 (b) Decision maker and programmer.

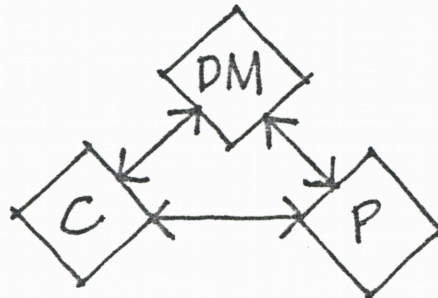


Figure 2.11 (c) Decision maker, programmer and client.

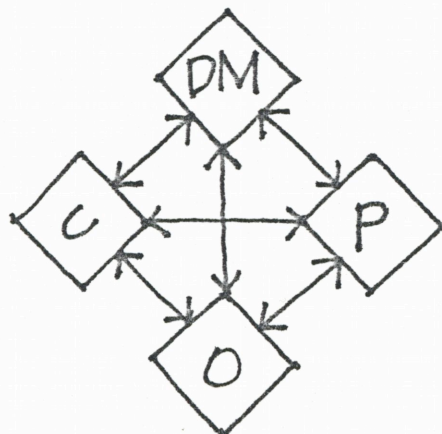


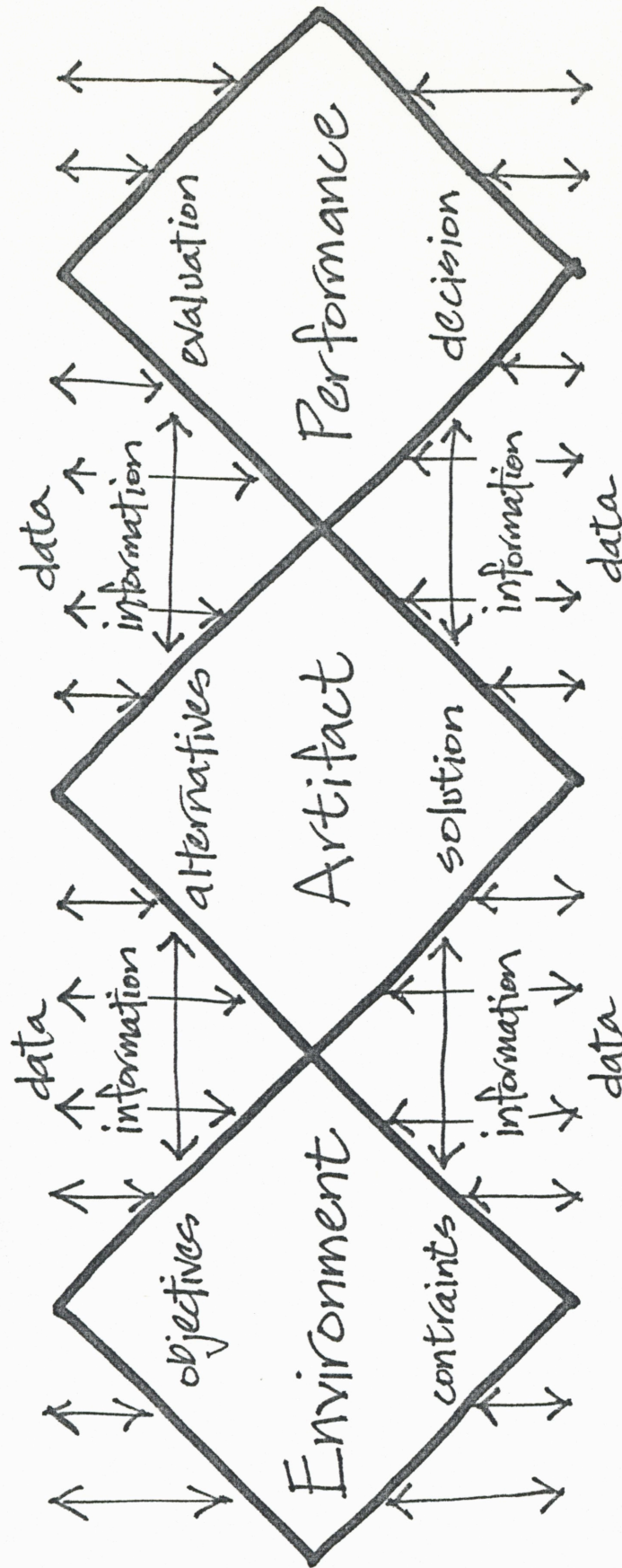
Figure 2.11 (d) Other sources of information.

Figure 2.11 Model of the social roles of responsibility.

Figure 2.11 (d) models a source of information that is intentionally sought after for the purpose of insuring a sound decision. Another sign of intelligence is the use of social interaction for the objective of making decisions.

Understanding information for decision making is done by modeling. A model is a tool for understanding which is instrumental in making an intelligent decision. Figure 2.12 shows an instrumental model for continuous decision making.

'ought'



'is'

Figure 2.12 Instrumental model for continuous decision making.

Figure 2.12 displays the three components in programming any artifact. The environment is the fixed constraints that are determined by the objectives. The artifact is for people. The artifact may be of any scale such as a city to a coffee pot. Performance is defined by the objectives which are controlled by management. Each of the three major components must be understood as a system to insure an intelligent decision. Modeling requires data.

Data, Information and Language

As discussed previously, decision making in planning a decision is continuously supportive of the long-term objectives and short-term goals.

The following figure displays the relationship between process, steps or stages, methods and techniques. Furthermore, this model ties into the structure what might be called the field of available raw data. Raw data is valued because it could be information used to achieve the objectives or purpose of the design process.

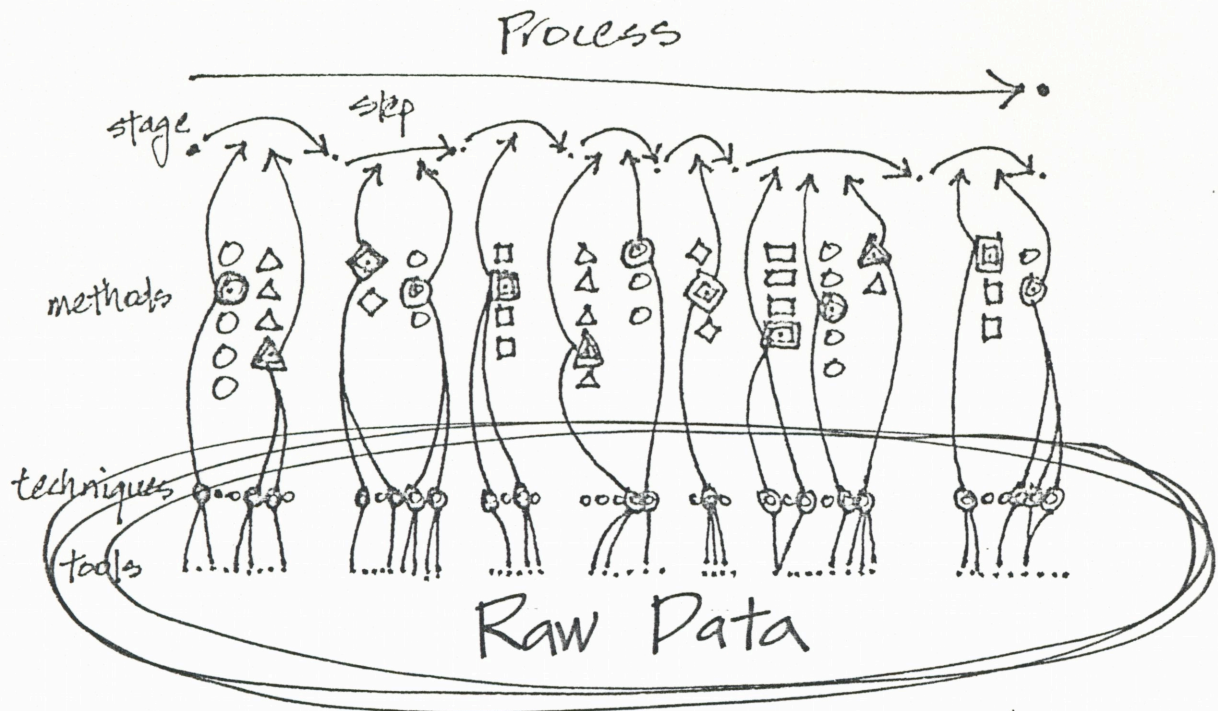


Figure 2.13 Model diagram of the relationship of a process and raw data.

Raw data becomes information when it is useful. Information is selected by choice through some purpose based on a value. In selecting and communicating information there are seven components that have been identified: 1) information source, 2) information encoding, 3) transmitting, 4) channeling, 5) receiving, 6) decoding of the information and 7) the information destination (Broadbent 1973).

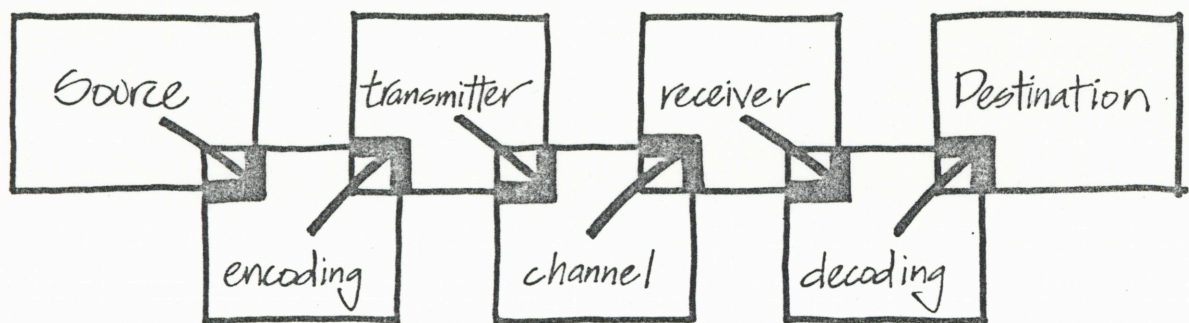


Figure 2.14 The process of communication.

An information source has a message and a purpose for distributing the information. The human mind is one of the most common sources of information. The motive is goal-oriented and has a known destination (e.g. person-to-person, book-to-person). This information is then encoded by transforming the message into symbols. Therefore, a decision is made in selecting from the available symbols for making a language.

LANGUAGE (L., lingua, "tongue.")

1. That body of symbols, their standardized meaning and the forms of expressing those symbols used as a method of communication.
2. Any means of expressing the contents of consciousness (feelings, emotions, desires, thoughts) in a consistent pattern of meaning. (Angeles, 1981)

This language may contain semantic noise which is distortion between the true message content and the selected language's ability to convey that true content. In selecting a language, common knowledge, skills and abilities of the source and destination must be consciously considered.

As an example, some clients do not understand the language of architectural plans or elevation drawings. However, the client may understand a three-dimensional model of that concept, which is the same information presented in a different language. Once the message is encoded, a transmitter is used to deliver the message through one of several methods (e.g. writing, speech, graphics). A channel is the medium by which this information is relayed. Examples of channels are books, drawings and television. Each medium can generate mechanical noise, which is background disturbances within that medium. Examples are, poor printing in a book, sloppy drafting and static on a television. Each channel then requires a receiver that attempts to reconstruct the original true message. This receiver must have common understanding of the language, which is used to decode the information with greater or lesser accuracy in meaning. Deterioration in quality or accuracy of understanding from the transmitter to the receiver is due to perceptual noise. Differences in experience between sender and receiver are the primary sources of perceptual noise. If the process of sending information is successful, there will be a response from the destination which will be caused by the initial message. The initial message pre-determines the range of responses.

A technique is valuable in generation, organization and the evaluation of transmitting information. Information is generated by analyzing the relationship between the

design process and the major design considerations. When the objectives of the information have been determined, the alternative techniques may be evaluated for the encoding of the information. Proper timing in communication is achieved by following the sequential design stages. At each design stage the major components of the systems are addressed. Care is taken so that a logical labeling of specific provocative words are used in stimulating a response. The decisions made in selecting the message become the objectives which are modeled for the purpose of an approved response by the destination.

C.R.S.'s technique of the information index becomes the source where the encoding of provocative words are organized. These words are then transmitted visually and verbally to the destination of an individual or group for a response. C.R.S. then responds by re-channeling through their written and graphic means called "analysis cards" and "brown sheets." Analysis cards and brown sheets are among the modeling methods that channel information for the purpose of eliminating perceptual noise. Re-channeling information is required during the design process for good communication. Analysis cards and brown sheets model rechanneled information for the purpose of adjusting misunderstood information. The total process in establishing good communication, rechannels information for continual clarification by means of models.

White's use of graphics as a language in encoding

information is similar to C.R.S. This form of language is effectively used to stimulate response from the destination or client also.

Style is the result of the individual's abilities, skills and knowledge of the language used. Style is the result of the individual's decisions from alternative techniques. A cartoon relays simple symbols that are quickly understood because of the combined use of written and graphic symbols.

The process of channeling information or 'communication' is natural. Decisions made during the process are too easily taken for granted, that is the inherent danger of noise due to our limitations in speech, writing, drawing, seeing, reading and listening. Good communication is a result of conscious decisions throughout a never ending use of the seven steps in channeling information. Language also is a component that is taken for granted. Testing for accuracy in channeling information one must consider the knowledge, skills and abilities of both the source and destination. Information channeled with language is communication.

Libraries have methods for searching for specific information. Figure 2.15 and 2.16 illustrate methods for generating and searching for specific information. Coding and labeling information sources have become the major concern for retrieval. (Bradfield, 1983). The universal decimal classification is an extension of coding the Dewey

Decimal classification. Furthermore, computers are becoming more available in executing select methods or software.

There is a limited selection of these methods or software because of the specialized skills, knowledge and language needed to perform a specific task.

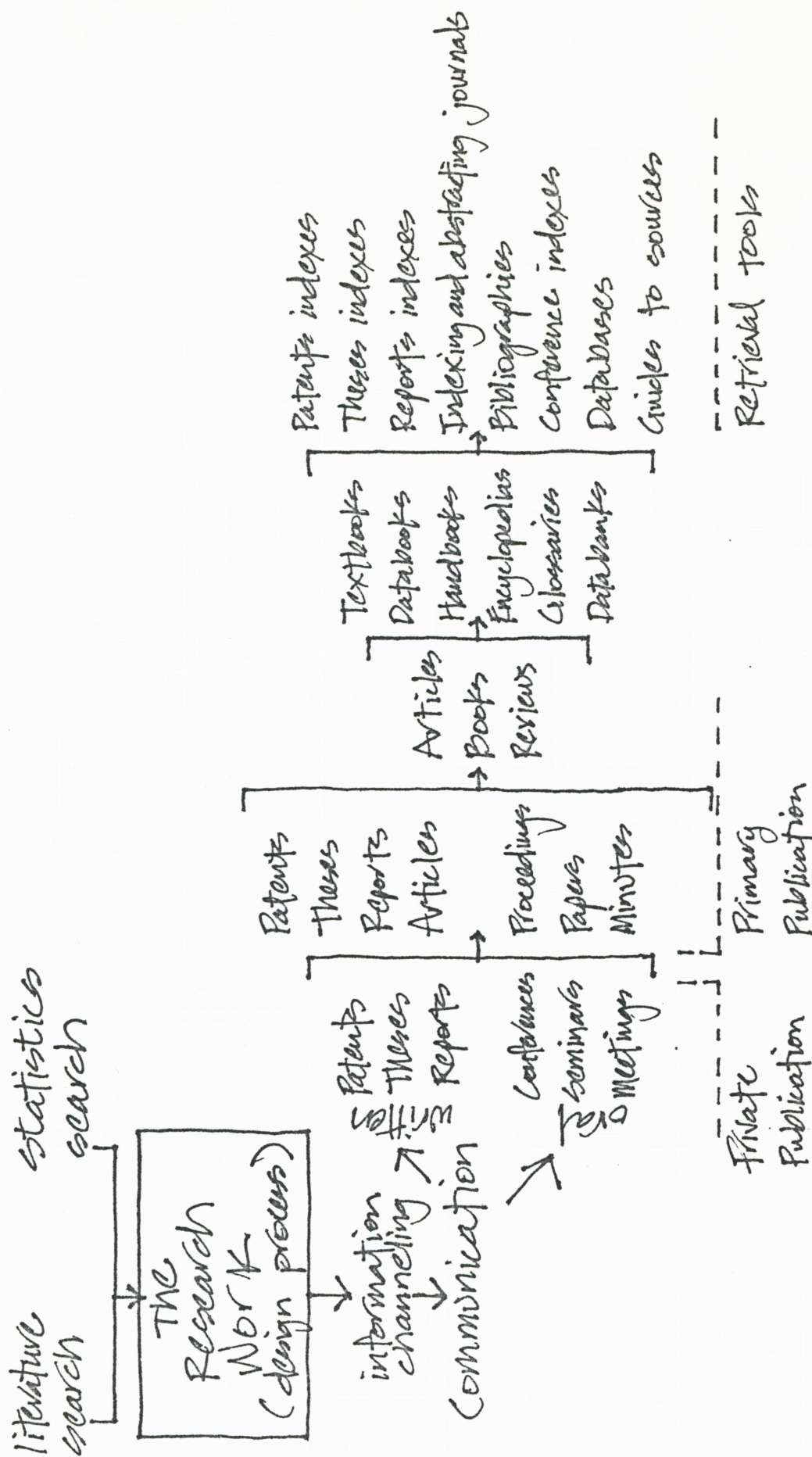


Figure 2.15 Generation of information (Valerie, 1983).

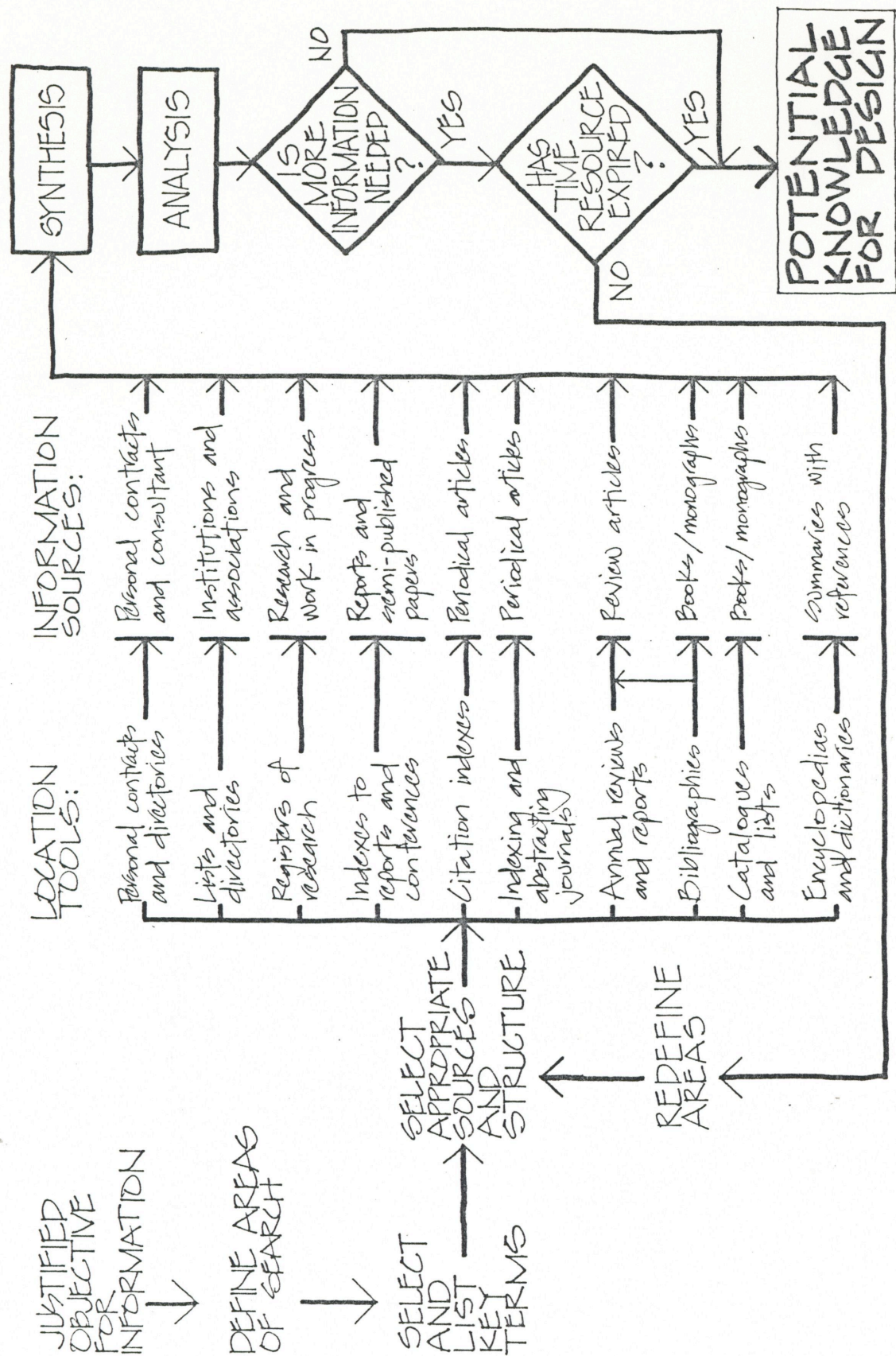


Figure 2.16 Information search chain (Valerie, 1983).

Decision making throughout an information process can affect the outcome of channeling a message. Appropriate choice of a language for effective communication is one of the fundamental decisions in all purposeful processes.

Knowledge, Wisdom and Values

Good communication requires an understanding of the decisions throughout the process of transmitting information. Common understanding of the objectives and abilities is valuable when selecting a language. This understanding can be achieved by means of a language. Therefore, communication requires a study of common knowledge. Epistemology is the study of knowledge which is valuable in channeling information.

EPISTEMOLOGY (GK., episteme, "knowledge") is the theory or the study of:
origins
presuppositions
nature
extent
veracity (truth, reliability,
validity) of knowledge. (Angeles, 1981).

There are six theories of the nature of knowledge. (White, 1982). Knowledge is a mental: 1) act, 2) achievement, 3) state, 4) performance, 5) disposition and 6) ability. It takes a mental act to attain knowledge about information. There is achievement when knowledge is gained. A state or condition exists in which an individual's stance is made relative to knowledge. There is a specific performance of activities or process of inquiry in attaining knowledge. A disposition is a tendency or liability due to

knowledge acquired. Tendency is an inclination toward some use of knowledge. Liability is being justly or legally responsible for having knowledge. Ability is the state or quality of being knowledgeable for making good decisions.

Two requirements must be attained to meet the standards in the philosophy of knowledge. (Maxwell, 1984). First, 'rational' decisionmaking and 'rational' action must be required. This active decision making is done by "rule of reason" which can control consistency or discipline in obtaining knowledge. Secondly, the research methods must be of an intellectual rational nature that attempts to improve knowledge.

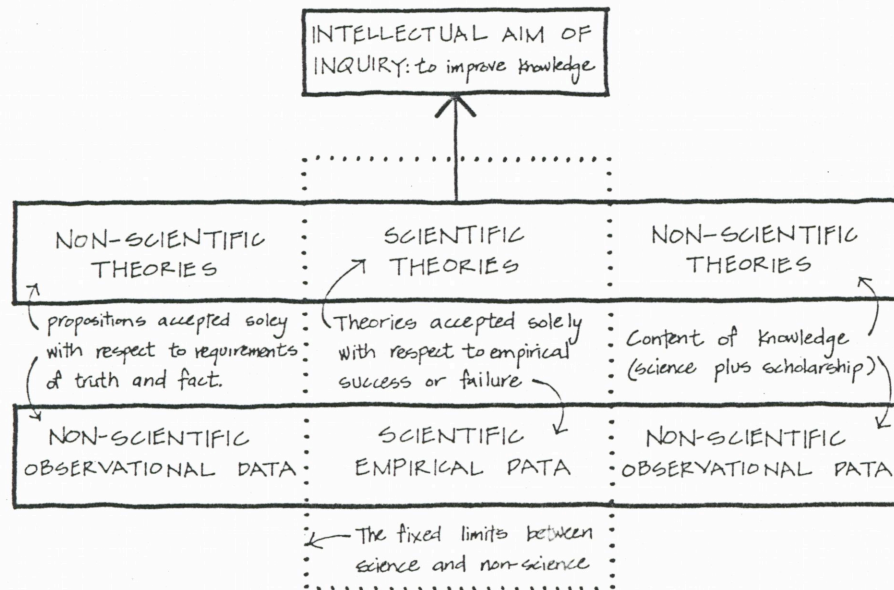


Figure 2.17 Intellectual domain of inquiry according to Maxwell's philosophy of knowledge (Maxwell, 1984).

The aim of improving knowledge is due to a value that justifies gaining knowledge. This value is the attempt to achieve the ideal or the 'best' knowledge that mankind has

not yet physically observed or experienced. In a recent lecture (Lappe, 1985) a valuable characteristic that decision makers ought to have was expressed. This value was the belief that the 'best' solution, is still yet to be discovered. It has been called the "extra-intellectual aims of inquiry" (Maxwell, 1984) which suggests an 'unlimited' nature for motivating new ideas. This is the domain of our non-rational information sources of intuition and creativity.

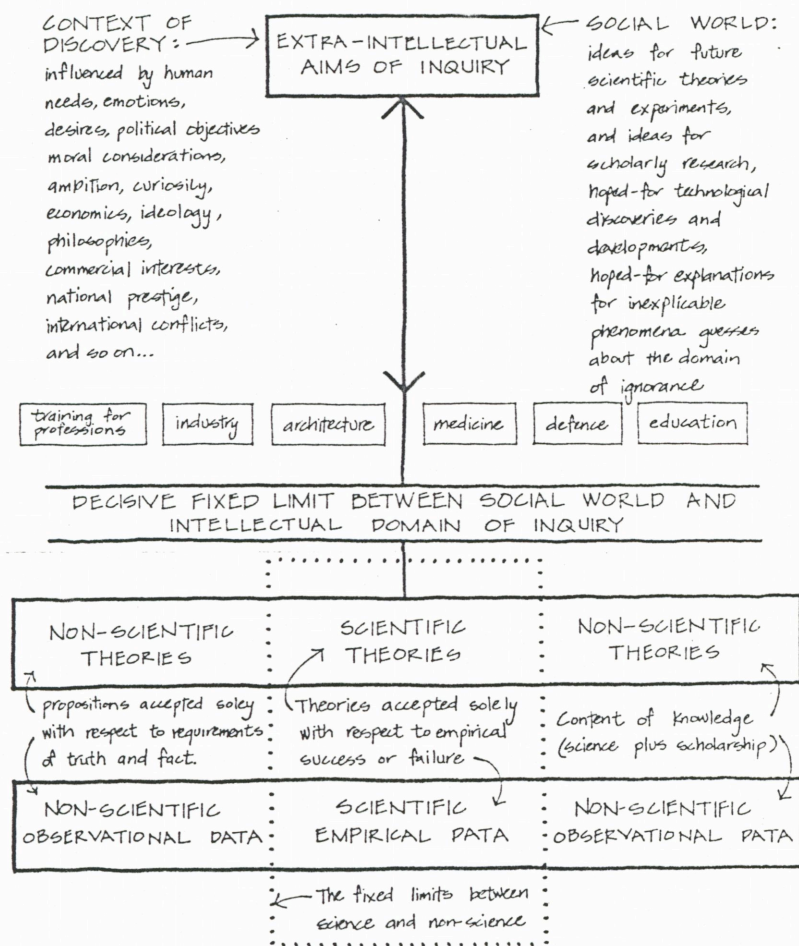


Figure 2.18 The relationship between the intellectual domain of inquiry and the social world according to Maxwell's philosophy of knowledge. (Maxwell, 1984).

In the philosophy of knowledge there exists a distinct limitation between the domain of inquiry and the social world where knowledge is combined with other aims. Einstein has said that his time was well spent at creating means but poor at understanding the ends. This statement identifies that man has created a myriad of means that often have no true purpose. A purpose and improvement in knowledge is wisdom. Churchman has stated that wisdom is rational and ethical.

WISDOM

1. Prudent judgment as to how to use knowledge in the everyday affairs of life.
2. The correct perception of the best ends in life, the best means to their attainment, and the practical intelligence in successfully applying those means. (Angeles, 1981).

Wisdom occurs when the aim of inquiry for improving our knowledge becomes an aim for resolving the problems in life. (Maxwell, 1984). This evolution requires a complex interaction of knowledge and optimism causing a value for improving the qualities of life. Emanuel Kant throughout his life asked three questions pertaining to knowledge and wisdom. What can I know? What ought I do? What may I hope? These three questions seek the limits of human intelligence, deontic knowledge, as well as, human abilities in wisdom. Figure 2.19 models a view of the social world and the intellectual domain of inquiry as seen by Maxwell.

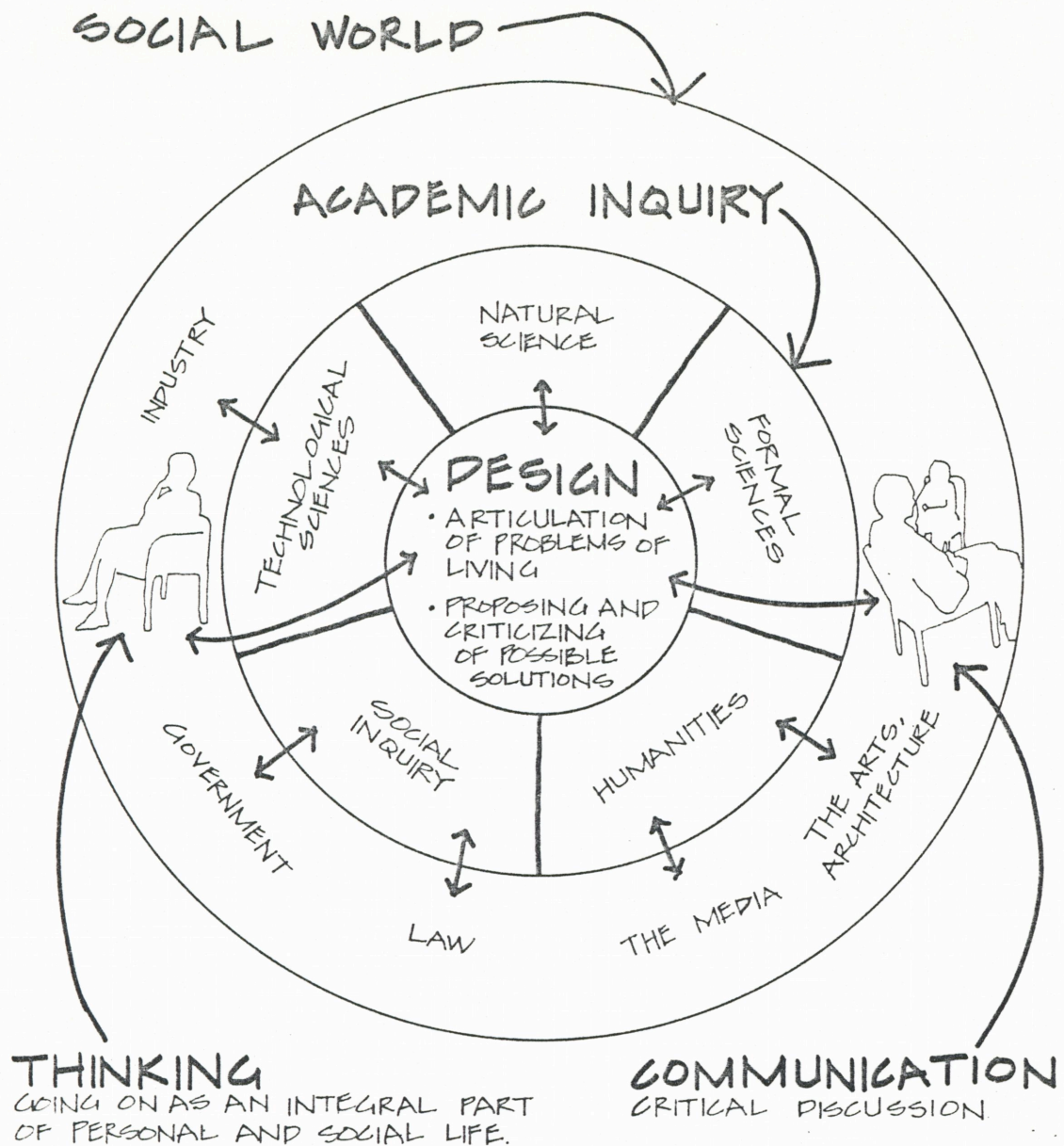


Figure 2.19 Relationship between the intellectual domain of inquiry and the social world according to the philosophy of wisdom. (Maxwell, 1984).

As shown above, academics are where specialized areas of thought are contained. Relative to this wholistic view of the world, the most fundamental components are life, actions and our performance abilities, both physically and metaphysically. (Maxwell, 1984). These fundamental

components identify with the human consciousness and human problem-solving abilities that act according to a knowledge of what is of value in life.

Some values are difficult to assess because of their metaphysical nature. Non-rational intuitive response is when our will evaluates and decides as if there was an unconscious decision being made from personal a priori knowledge. In a study of values by Maxwell (1984), "How can there be life of value in the physical universe?" What existing in life is of value? And how do we experience value? This is assuming that scientific knowledge of existing value is from our experience of value. Two presuppositions were stated as conclusions to this study.

First, all life is purposive or aim-pursuing in character. We are what we do. All our human world (personal, social, cultural, intellectual, spiritual) is purposiveness. Person-to-person understanding is a special case of purposive explanation. The latter explains the actions of an aim-pursuing entity essentially by showing how these actions fit into a pattern of hierarchically organized goal pursuing.

The phrase "we are what we do" distinguishes value. The pronoun 'we' identifies the social aim of sharing values. With shared knowledge or wisdom we might say 'we ought to be what we can do.' This 'ought to' is what is called "deontics" statements in planning (Rittel, 1972).

Secondly, we need hope of enabling us to improve our understanding of how cooperative aim-oriented rationalistic life of value might come to be in the physical universe.....

....(therefore, we ought to because we can) emphasize the fundamental importance of endeavoring to put cooperative aim-oriented rationalism into

practice in our lives, within the framework indicated, so that we may come to develop a less cruel, more loving world. (Maxwell, 1981),

In recent decades an awareness of social planning has developed. Several architects have taken a stance in the attempt to raise the awareness of social cooperation in the design process. (Sanoff, 1977; Wade, 1977; Preiser, 1978). High population density coupled with scarcity of resources have magnified social problems. These social problems generated a value for wisdom in planning, most commonly known in the discipline of architecture as urban planning.

In a study of values six major categories of cultural values were listed: 1) theoretical, 2) economic, 3) aesthetic, 4) social, 5) political and 6) religious. (Broadbent, 1973). The definitions for each category are given below for further understanding.

Theoretical is a dominant interest in abstract truth within the fields of philosophy, mathematics, physics, chemistry etc.

Economic is emphasizing utility and practicality with interests in money, market conditions, real estate, standards of living, business and organization.

Aesthetic is the interest in poetry, architecture, music, ballet, modern painting, literature, sculpture, the past and placing high values on pageantry, beauty, sensitivity, harmony and design.

Social is concerned with human rights, altruistic, unselfish, desiring to help others in welfare work,

voluntary service, counseling, care for the sick and aged.

Political is interested in government, administration, leadership, forming public opinion, debate with a strong desire to influence others. Plays games to win, pits himself against nature, seeks prestige.

Religious is faith and membership of a particular religious group, but much more concerned with spiritual revelation, reverence, spiritual aspiration and communion. Searches for a cosmic purpose and seeks to understand the meaning of the universe as a whole.

Through these definitions of cultural values, it may be observed that an individual's values are a mixture of these major categories. In further studies, these categories were used in polling Americans to determine if there exists a dominant value category among the six categories.

(Broadbent, 1973). The results of these studies showed that in a specific interest group, such as architects, there exists a noticeable response in a specific value category. This measurement was compared relative to the average measurement of Americans polled. Among the six categories, architects had a relatively higher value in the aesthetic (highest) and theoretical categories. As stated earlier, "We are what we do." The architects lowest measures were in the categories of social (lowest) and economic values. Also we might assume, we are not what we do not do.

AXIOLOGY (GK., axio, "worthy," and logos, "the study of"). The analysis of values to determine their:

- meaning
- characteristics
- origins
- types (levels or intensities)
- criteria
- epistemological status.

VALUE (L., valere, "to be worth"). The quality of a thing which makes it:

- desirable,
- desired
- useful
- or an object of interest.

QUALITY (L., qualitas, from qualis, "how constituted," "as a thing is").

1. That characteristic which is possessed by a thing and by which the thing is recognizable.
2. That content of consciousness usually associated with external objects produced by physical stimuli. (Angeles, 1981).

By the three definitions above, it can be seen that knowledge and wisdom are qualities of value. There is a value in a particular kind of knowledge that is wisdom. This value for wisdom can be used to improve the quality of life. The value of wisdom causes a pursuing of aim-oriented knowledge. This value can in some measure be expressed in the form of a motive for attaining some specific knowledge. Examples of this could be labeled: 'environmental gain', 'political profit', 'economic killing', 'physiological loss'. These measures of values may or may not sound familiar because of individual or cultural priorities that have been chosen in one's life. Culture and personal experiences tend to specialize values because of the environment of constraints. An intentional act of

wisdom can open a broader perception of the world.

Strategy, Tactics and Anti-Planning

A strategy is a 'grand' plan for achieving an end. Decisions are made for organizing stages and selecting methods and techniques by both rational and non-rational means. Raw data can aid wisdom in communicating useful information. This wisdom can further aid the decision makers in planning tactics. Tactics are identified by the specific procedures which define roles of who, what, where, when and how to achieve short-term goals. Methods are the choices of available tactics for gaining the short-term goals. Tactics organize steps that may be parrallel, sequential, or rely on the completion of multiple previous steps as shown in Figure 2.20.

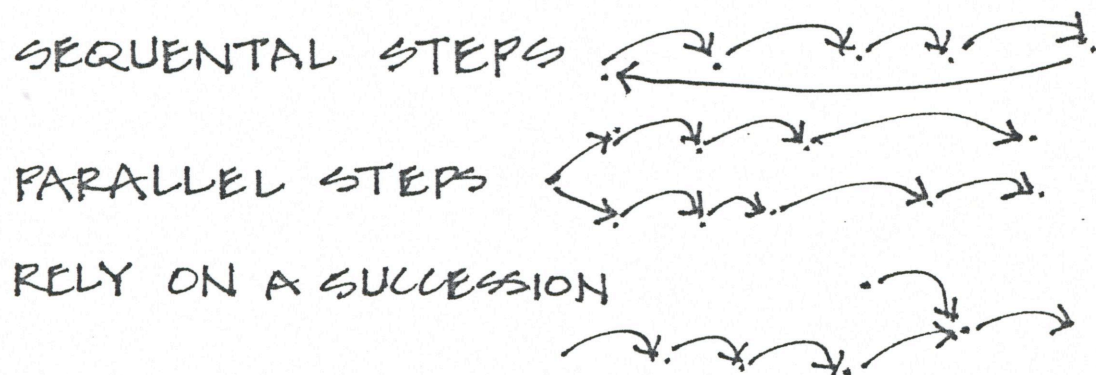


Figure 2.20. Possible tactics of steps.

Each decision in selecting method and technique components within a step has a number of possible outcomes. The decision maker(s), whether or not they accept the responsibilities for the decision, is accountable for the

outcome. Accountability exists because of the direct response of changing a system's effectiveness in route of achieving the objectives and goals. Responsibility is an instrumental value in planning.

Churchman has identified values that have negative effects on planning any strategy. (Churchman, 1979). Six types of strategy options have been identified and labeled "anti-planning." (Churchman, 1979). The six types are: manager, sceptic, determinist, religious, self and the non-intellectual approaches in anti-planning.

The manager type is the most common in the United States. Here the leader or manager receives their practical experience 'growing up' in the business. Learning is an adoption of the previous role models of the earlier managers. This planner does not intentionally seek further outside information for decision making. Pure experience in the existing organization is all that it takes to make a sound decision. Two heads are not better than one in this type of planning especially if the other is young and inexperienced.

The sceptic type planner believes that we cannot attempt to understand the elements in an organization. This type of planner lives in a mystical world. The sceptic's philosophy does not believe it possible to improve, and asks continuous questions of "so what." A sceptic challenges the decisions made in establishing a strategy.

A determinist has a philosophy which believes that

decisions are made from social forces. An individual cannot plan because of the social pressures that produce uncontrollable changes. This results in an evolution of the original plan into a new unplanned plan. Therefore, an individual cannot choose a strategy.

A religious anti-planner does not believe it is a role for humans to plan. Total planning here is a priori from a higher controlling source. This ultimate plan is so established that anything humanly unique or unaddressed must be outside of the plan. Therefore values for further knowledge does not exist. The greater plan is good and our limited understanding is sufficient.

The self anti-planner is metaphysically oriented. Metaphysical in that the real world exists within the individual alone. Wholistic planning would, if it exists, be a total awareness within the individual. This has no social value in planning. What one does is only valued within oneself.

The final anti-planning approach is the non-intellectual. This planner does not believe that thinking has any value. Value lies in the essence of a thing. Esse, is Latin, meaning "to be." For the non-intellectual planner, "What is not said at all is the most important thing of all." (Churchman, 1979).

Each of the anti-planners above have beliefs that are based on their values of the world. Limiting information or a rigid structuring of values are two dangers in forming a

poor decision. An awareness of how influential values are, suggest the possible social conflict involved in a programming process.

Each belief has limitations due to the amount and type of information that has been processed. Figure 2.21 models the ethical question of determining the environment of fixed constraints.

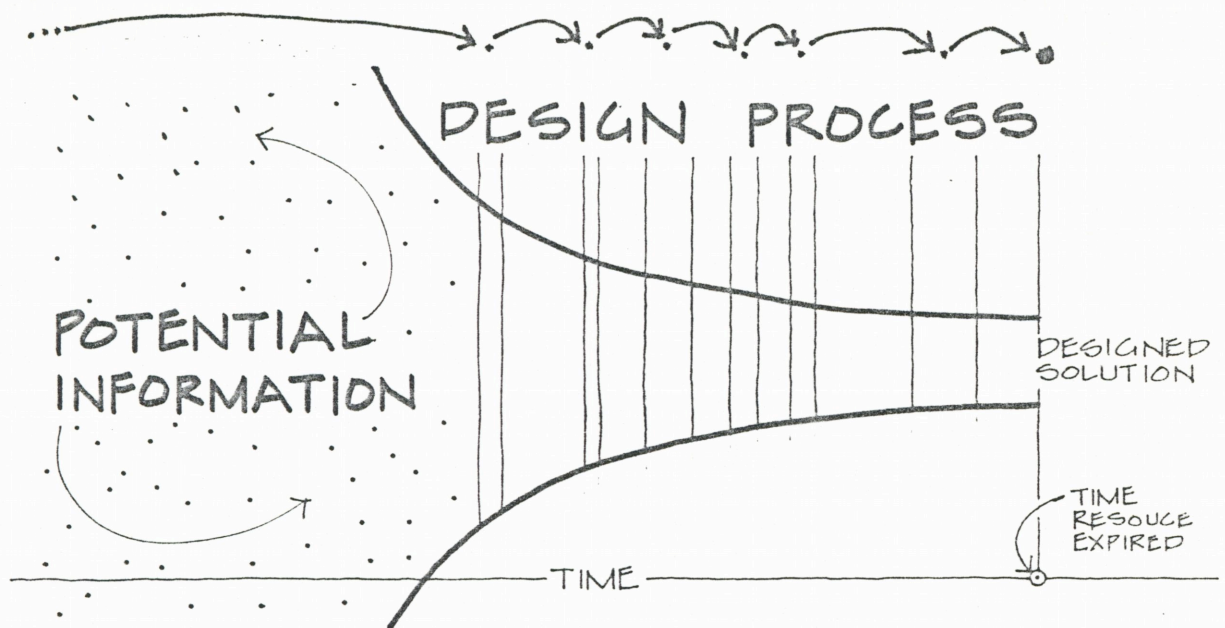


Figure 2.21 The decision of limiting the environment of fixed constraints in a planning system.

Problem Solving Strategies

This ethical question causes conflict in all design processes. How much is information worth before a decision is made? Is there a choice? Who decides? Decisions can be made with very little information. Ethically speaking, all possible information should be utilized when making a decision. This is a never ending argument in defining the environment of fixed constraints in a planning system.

There are two factors considering all possible information. One is time. Once an objective has been stated, information will be pursued to attain that value. The quality of information will vary according to the individual process used and the amount of time allocated. This potential amount of information is a factor of the structured process in which information is processed. Therefore, the structure is the second factor along with time. It is conceivable that a fixed number of steps in a structure can utilize all known information. This idea would require a certain amount of time to properly work.

All problem solving strategies must address the components of a system: objectives, constraints, resources, activities and management.

Design Intelligence

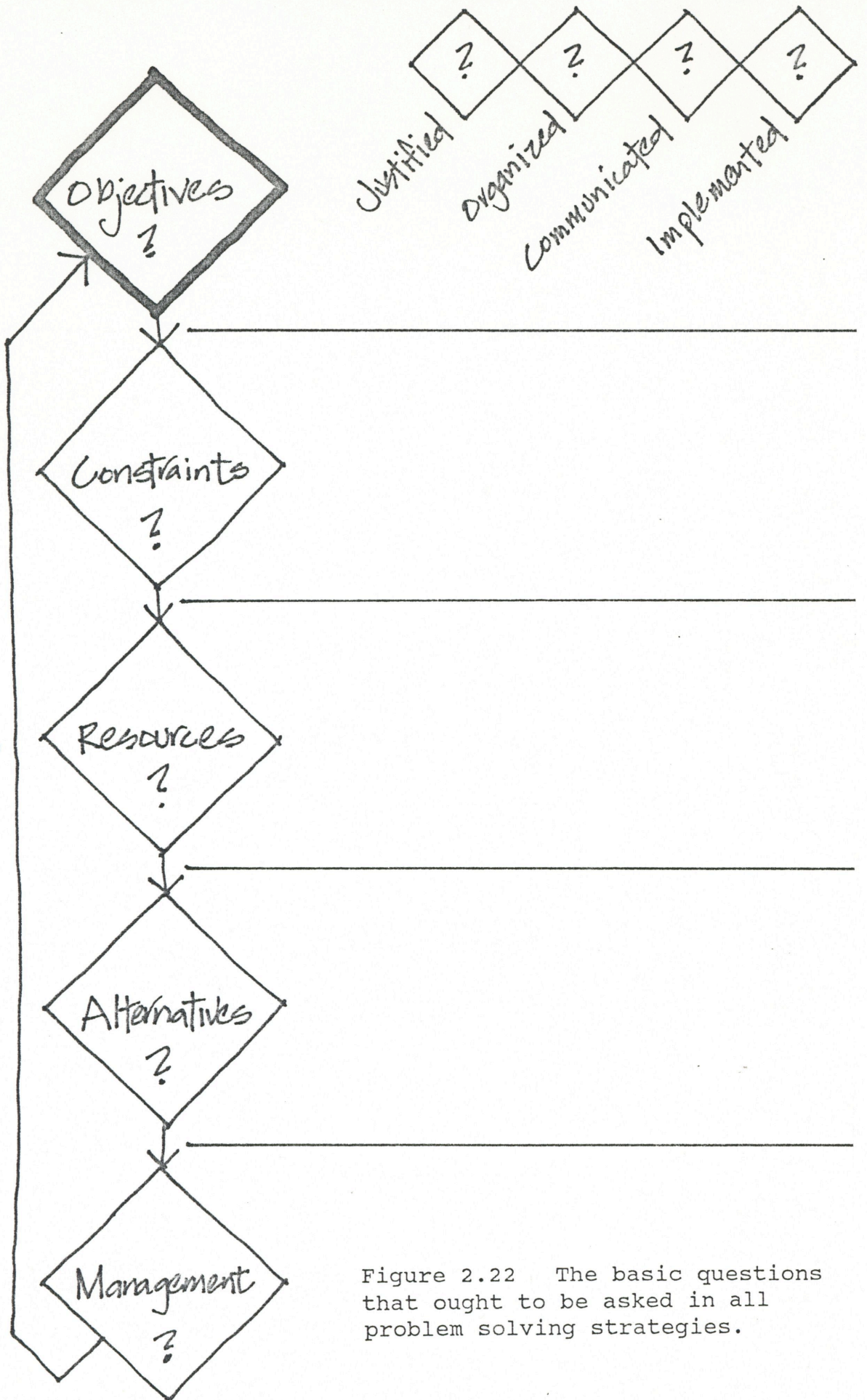


Figure 2.22 The basic questions that ought to be asked in all problem solving strategies.

Don Koberg (1979) has researched and studied the best known problem solving strategies in an attempt to organize a Universal Process. Appendix F contains Koberg's collection of problem solving strategies.

<u>STAGES</u>	<u>DESCRIPTION</u>
ACCEPTING	purposeful, intentional, enthusiastic, self-motivated, driven, fearless
ANALYSIS	curious, skeptical, questioning, divergent, subversive, perceptive, conscious or aware, sensitive, discontented, experimental
DEFINITION	insightful, theoretical, strong- willed, conceptual, pattern-finding, independent, convergent
IDEATION	generator of alternatives, inventive, changeable, fickle, 'lateral', variable, freely associative, open- minded, adventurous
SELECTION	selective, comparative, assertive, courageous, discerning, sure
IMPLEMENTATION	resourceful, active, imaginal, practical, skillful, adaptive, expressive
EVALUATION	self-conscious, critical, constructive, value-oriented, reflective, retrospective/prospective, self-improving

Figure 2.23 Koberg's Universal Process.

Koberg's universal steps begin with accepting a challenge to improve the quality of life. Then one analyzes the accepted challenge to understand the essential characteristics. This analytic pursuit defines the true nature of the challenge. Ideas are then created and synthesized into alternatives that solve the defined challenge. A decision is made in selecting the best alternative. The implementation of the best alternative is pursued and achieved. Finally there is an evaluation. This evaluation will aid in preparing for the next challenging problem.

Problem Types

A study has analyzed this ethical question of acquiring further information and has classified two problem types. (Rittel, 1972). The first problem type is called the "tame problem." Tame problems have a known method to attain a solution. An example would be a question in mathematics. A person is given all the known information required to complete an algorithm to solve the problem. This type of problem can have a data bank or checklists which can be used as a resource for future problems.

The second problem type is called a "wicked problem." All planning and programming problems are wicked problems. In a wicked problem, any statement defining it is directly the problem's solution. Therefore, the first critical step in solving a wicked problem is to understand why it exists rather than defining the problem. Wicked problems are

interrelated so that it is difficult in knowing whether a solution in one area is actually making the problem worse in another area. This interrelationship involving other unconsidered areas is why the ethical question of obtaining additional information exists. This decision for obtaining additional information is the first step in all design processes.

Churchman (1979) has stated axioms in the theory of planning decisions which have since been called the "second generation" of the Systems Approach. (Rittel, 1972). "The systems approach begins when one looks through the eyes of others." With this perspective there is an awareness of a "symmetry of ignorance" due to the nature of an individual's knowledge. Therefore, when a designer is making a decision, modeling an expert in each field of wisdom is beneficial. Modeling 'experts' will aid in making a rational decision. This model would also establish a "maximized involvement" rather than a "planning at" relationship with people involved in various aspects of the decision. At each step in the decision making process there is "ought to be" goals and objectives stated in a 'transparent' method for channeling information. Goals and objectives are an open invitation for all people to give input into the decision. This also includes Churchman's anti-planners which are seen as strengthening the decision. A wholistic perspective will expose further problems and develop confidence in making a decision. An optimistic

solution will then be tried. All solutions are an experiment which resulted from confronting many ideas. Therefore, philosophical argument makes all planning problems political. These rational and non-rational arguments are reasons that contribute to the decision.

In summary, problems have been defined that have two basic natures, "tame" and "wicked." Tame problems have all the information needed to solve the problem. Wicked problems are all planning problems such as design. Information must be pursued in wicked problems. A decision must be made of how much information should be gathered and when should one start a schematic design. When does a problem become tame? In any a priori design process there ought to be only one decision type, a shared decision in which a systematic approach may be used.

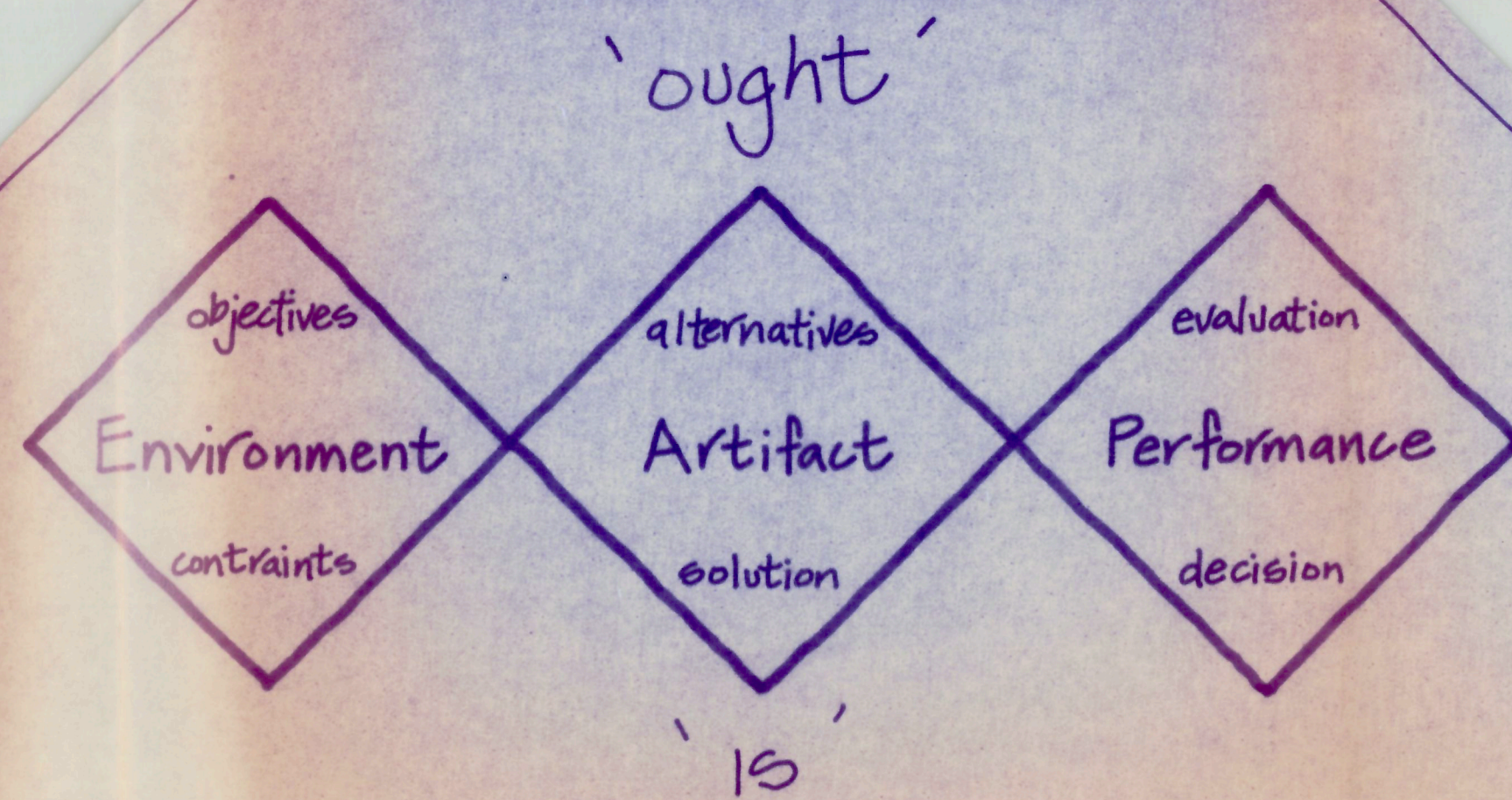
CHAPTER 3

CONCLUSION

This thesis contains research on programming that arose from a systemic view. The following conclusions are an outcome of the systemic view. 1) An ideal set of programming information does not exist nor does the ideal form or format for programming exist. 2) Programming is not a 'pre-design phase,' programming is design. 3) All designers 'ought to' consider themselves as "information managers." 4) Programming is best accomplished when controlled systemically outside of the 'action.' 5) Values are never wholistically represented, therefore values must be intentionally modeled. 6) Modeling should be taken more seriously. Models "embellishes the mind" therefore each action spent should critically decide the a) objectives, b) abilities and c) form, in that order. 7) Decision making 'ought to be' considered 'sacred' since the nature of responsibility can easily be neglected in a shared decision. 8) Design intelligence is not a linear progression. A strategy must intentionally direct the progress of a purposeful process back through in a circular intelligent process. 9) The only 'programming report' that exists in architecture is the architectural artifact that people live in.

The various paradigms discussed in this thesis may seem obvious at first. As a result of the obvious nature of

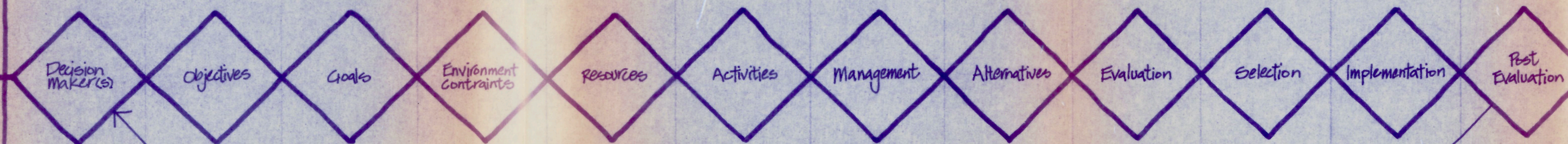
these paradigms is that they are easily assumed. If the paradigms are assumed, they are not utilized to the best of their known abilities. A denial of this knowledge will waste resources and efforts to achieve the desired objectives. To take something simply for granted will produce noise and not solutions. Objectives should not be written and forgotten but rather magnified by modeling. Modeling is an important stage in the trial and error design process. Using a planning system will result in the best possible efforts to reach the desired objectives within a given time constraint. The following model is a network for the general client. This model is to aid in understanding how an intelligent design strategy is in a loop configuration. The configuration of stages and steps has set the 'track' for sharing decisions in a systematic approach.



Instrumental model for continuous decision making.

VALUES:
PHYSICAL
FUNCTIONAL
SOCIAL
LEGAL
POLITICAL
ECONOMIC
AESTHETIC
TIME

'ought' →



'is' →

Design Intelligence

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APPENDICES

APPENDIX A

APPENDIX A.1

American Institute of Architects Programming and Related Services

AIA Document B141 (July 1977 edition)

OWNER RESPONSIBILITIES:

Program

- Design objectives, constraints and criteria
- Space requirements
- Space relationships
- Flexibility and expandability
- Special equipment and systems
- Site requirements

Budget

- Contingencies for bidding
- Change orders in construction
- Funds available for project and sources

Site

- Legal description
- Certified land survey containing: grades, streets alleys, pavements, adjoining property, right-of-way, restrictions, easements, encroachments, zoning, deed restrictions, boundaries and contours of the site, locations, dimensions, existing buildings, other improvements, trees, information on available service, utility- public and private, above and below grade including inverts and depths.

Soil Engineering

- Test boring
- Test pits
- Soil bearing values
- Percolation tests
- Air and water pollution tests
- Ground corrosion
- Resistivity test
- Subsoil, air, water conditions reports and professional recommendations

Inspections

Legal, Accounting and Insurance

APPENDIX A.2

Checklist of Pre-Design Criteria

AIA Document B161/162

PREDESIGN

Programming:

- Design objectives, limitations and criteria
- Space requirements
- Space relations
- Number and functional responsibility of personnel*
- Flexibility and expansibility
- Special equipment and systems
- Site requirements

Space Schematics/Flow Diagrams for:

- Internal functions
- Human, vehicular and material flow patterns
- General space allocations
- Analysis of operating functions
- Adjacency
- Special facilities and equipment
- Materials handling
- Flexibility and expansibility

Existing Facilities Surveys: Researching, assembling, reviewing and supplementing information for projects involving alterations and additions to existing facilities or determining new space usage in conjunction with new building program

Marketing Studies: Determining social, economic and political need and acceptability of the project

Economic Feasibility Studies, estimates of:

- Total project costs
- Operating and owning costs
- Financing requirements
- Cash flow for design, construction and operation
- Return on investment
- Equity requirements

Project Development Scheduling: Establishing tentative schedule for predesign services, decision making, design, documentation, contracting and construction

Project Budgeting:

- Conversion of programmed requirements to net area requirements

*Additional programming criteria from AIA Document B141.

(AIA Document 161/162) (Con't)

- Development of initial approximate gross facility areas
- Evaluation of construction market conditions
- Application of unit cost data to gross areas
- Estimates of related costs such as site development, landscaping, utilities, services, furniture, equipment, and design services

Presentations to:

- Owner
- Building committee/staff committee
- User groups
- Financing entities
- Owner's consultants

SITE ANALYSIS

Site Analysis and Selection, including:

- Identification of potential sites
- On-site investigations
- Movement systems, traffic and parking studies
- Topography analysis
- Analysis of deed, zoning and other legal restrictions
- Studies of available construction materials, equipment, labor
- Studies of construction market
- Overall site analysis and evaluation
- Comparative site studies

Site Development Planning: Preliminary site analysis; comparative evaluation of conceptual site development designs

On-Site Utility Studies: Establishing requirements and preparing initial designs for on-site utility services

Off-Site Utility Studies:

- Confirmation of location, size and adequacy of utilities serving site
- Determination of requirements for connections to utilities
- Planning for off-site utility extensions and facilities

Environmental Studies and Reports:

- Determination of need or requirements for environmental monitoring, assessment and/or impact statements
- Ecological studies
- Preparation of environmental assessment reports
- Preparation of environmental impact reports

Project Budgeting: Development of statement of probable construction cost for site-related work based on programming and scheduling of site work and consisting of application of unit cost data

APPENDIX B

APPENDIX B.1

White's Checklists Used in Programming

Traditional Facts

Similar projects and critical issues

- past projects of similar function, circumstance and scope
- critical issues involved in the building type
- trends in the field

Client

- client goals
- philosophy of the organization
- goals of the client's process - sub-goals to achieve main goals - user goals
- staff organization and framework - personnel diagram
- rank and role of personnel
- major departmental divisions within the organization-role of each-goals and sub-goals within the overall process
- critical issues involved in the organization (people to people relationships, "channels")
- does organization actually operate the way it is structured?
- divergence of present operations from expressed goals - possible improvements
- degree of achievement of sub-goals
- individuals or committees responsible for planning with architect-role and responsibility in decision making
- related (non-client) organizations which might affect planning
- impact of change or growth of related organization

Financial

- budget - firmness, degree of flexibility
- funding methods - bonds, loans, fund raising
- timing - construction costs, escalation, interest rates, concurrent similar projects taxing public support
- construction phasing-prices, local construction market, strong and weak local trades, incremental construction
- design requirements of lending institutions
- comparative cost data on similar projects which have been constructed

Building Codes

- occupancy allowed
- structural loads allowed
- exits required

- stairs (number, type, access, fire rating, size, minimum distances to reach stairs)
- fire ratings required of materials
- ventilation - openings
- toilets (number and fixtures of each)
- fire sprinklers
- alarm systems

Planning by related organizations

- duplication of services
- review boards
- approval boards (regulations, by-laws, planning criteria)
- projected construction of similar projects

Function

- operational systems-including links beyond the building
- critical issues in insuring success in systems' operation
- needs which are supporting to operation (lounge, waiting, toilet, janitor)
- main operational sequences - "feeder sequences" which support main sequence
- divisions or departments in the system
- general departmental relationship affinities
- number and type of people involved (task categories)
- operations performed by each type of person
- systems of people movement
 - points of origin and destination
 - frequency and pattern (continual or intermittent)
 - degree of urgency
 - role in the overall operation
 - peak loads

Systems of Information Movement

- points of origin and destination
- frequency and pattern (continual or intermittent)
- degree of urgency (speed required)
- role in the overall operation
- form
- storage implications
- operations performed on information (including production and removal of trash)
- peak loads

Systems of Material Movement

- points of origin and destination (including delivery and pickup)
- frequency and pattern (continual or intermittent)
- degree of urgency
- role in the overall operation
- form (size, weight)

- special considerations (fragile)
- operations performed on material (including unpacking and disposal of waste)
- storage implications
- peak loads

Work Nodes (stations where work is performed)

- number, type and relationships
- number and type of people at each
- nature of tasks performed
 - key issues in successful performance of tasks
 - identification of possible sources of strain in performing tasks
- furniture and equipment required for each person (including visitors, clients)
- accessories required for each person
- sizes, electrical requirements and other considerations regarding furniture, equipment or accessories
- area requirements of each node
- circulation patterns within each node (people, material, information)
- security requirements (open, closed, locked)
- general electrical requirements at each node
- criteria for selecting architectural surfaces and detailing
- special relationships with other work nodes (visual control)
- lighting requirements
 - intensity required at task
 - incandescent vs. fluorescent
 - direct sun vs. indirect
 - skylight vs. window
 - need for total darkness
 - need for controlled lighting

Sensory

- type and intensity of stimuli produced (noise, odors, vibration, dust, electro-magnetism, bacteria)
- type and intensity of stimuli which must be excluded or screened (including visual privacy)
- important environmental situations (mood, atmosphere)

Air Conditioning Requirements

- heat generated by equipment and people
- special air circulation or ventilation requirements (isolation, 100% exhaust, decontamination)
- special temperature requirements
- air additives
- special controls over air conditioning
- grouping of similar air conditioning requirements
- total needs

- space required for mechanical
- vibration control
- heating and cooling seasons

Site

Legal description of property (boundaries, dimensions, rights of way, deed restrictions, easements, curb cuts, hydrants, poles)

Zoning

- present allowable uses
- setbacks
- access points
- relation to street lights and median breaks
- density
- heights allowed
- parking required

Utilities

- locations
- distances to site
- depths
- telephone, gas, water, sewer, electrical
- capacities (present and projected)

Soil Conditions

- percolation
- bearing
- chemicals
- density

Land Contours

- elevations
- drainage patterns (including from and to adjacent land)
- flood basins (tides)
- blocked visual access due to mounds and ridges
- points of visual emphasis
- flat areas
- slope orientation to surrounding areas (visually)

Significant Features

- rock outcroppings
- existing buildings
- ditches
 - water
- trees

Existing Foliage

- tree types
- limb spread
- height
- ground cover (where drainage may be affected)

Sensory

- noise (direction, intensity, frequency, pattern, probability of continuance)
- odors (direction, intensity, pattern, type, probability for continuance)
- visual (poor views, good views, public and private zones, reliability of continuance of view)

Time-Distance

- car-pedestrian
- to and from significant points on and around site
- time-distance on site

Existing Pedestrian Traffic On and Around Site

- volume
- location
- frequency and pattern (time of day, continual, intermittent)
- nature (to work, school, lunch, random stroll)
- possible contribution to these activities

Existing Vehicular Traffic On and Around the Site

- volume
- location
- frequency and pattern
- nature
- possible contributions to these activities

Surrounding Physical Environment

- surrounding zoning
- possible development on adjacent and surrounding property
- profile (skyline)
- scale
- image
- materials
- forms
- density
- light (shade and shadow)
- orientation (views of site from other points)
- landscaping forms
- details
- geometry (existing paving patterns, building edges and

heights, axes, walls, modules and rhythms)

Surrounding Social Environment

- identifiable patterns
 - ethnic groups and values
 - relationships between groups
- Shadow Patterns on the Site (trees, adjacent buildings)

Parking and Site Circulation

- needs (present and projected)
- area required
- dropoffs required at entry
- lighting
- special controls (restricted parking)
- on-site circulation required (between buildings)
- supporting circulation (to lunch, to work)
- volume and frequency patterns (peak loads)
- patterns of direction of entry approach and departure (people and cars)
- existing roads
- points of logical access-egress (all types of traffic)
- surrounding land values

Climate

- rainfall (frequency, volume, patterns)
- sunlight (critical vertical and horizontal angles)
- temperature (seasons, extremes)
- wind, breezes (seasons, directions, velocity, extremes)
- snow (seasons, volume, patterns)
- humidity (seasons, percentages)
- potential natural catastrophes (tornado, hurricane, earthquake, flood)

Growth and Change

- present and projected supporting market or public served
- projected staffing (number and type)
- projected goals and supporting sub-goals
- anticipated deletion of departments and addition of new departments
- areas of expected changes in operations (layout and building perimeter implications)
- projected changes in information or materials systems (disposables)
- influence of growth and change of one department on all others
- future area needs (construction, cost, design and parking implications)
- projected utility needs - comparison with present and projected supply capacities

APPENDIX B.2

Non-Traditional Facts:

- role of physical environment in learning
- effects of visual order versus complexity on learning
- effects of centralization vs. decentralization of workers on efficiency
- effect of worker group size on performance
- relationship between topic of conversation and conversation distance
- effect of background brightness on visual acuity
- effect of specific colors on visual comfort
- effect of visual clutter on visual efficiency
- relationship between sound frequency of speech and intelligibility at receiver
- noise frequency-sonic annoyance relationships
- relationship between continuous and random noise and performance
- effects of random noise on boredom
- relationship between continuous and random noise and performance
- effects of random noise on boredom
- relationships between natural land features and settlement patterns of high income families
- effects of government involvement in housing on construction techniques
- effects of new shopping centers on surrounding areas
- effects of new CBD construction on the municipal budget
- physical effects of sunlight on architectural surfaces
- actual effects of large amounts of glass at exterior walls on mechanical equipment costs
- effects of fire on architectural materials

- effects of washing machines on individual sewerage
- effects of exterior plastics on interior thermal comfort
- effects of new adhesives on traditional architectural materials
- relationship between the use of mathematical models in design and building programming
- effects of new decision theory on sequence of concerns in design synthesis

APPENDIX B.3

White's List of Fact Sources

- Interviews with the client himself
- Interviews, questionnaire surveys and observation of the client's staff and operation
- Consultants (site surveys, soil tests, furniture and equipment, efficiency experts, researchers, electrical, mechanical, structural, fund raising, financial planners).
- Books and periodicals on planning for the building type
- General planning standards (FHA Minimum Property Standards, Time Saver Standards, Building Planning and Design Standards, Graphic Standards).
- Planning information from pertinent associations and manufacturers
- Uniform Building Code and local zoning ordinances
- Governmental regulations
- Empirical measurement of important sensory situations
- Manufacturers' catalogs and representatives
- City building inspector
- City Planning and utility departments
- Local utility companies
- Local aerial photography firms
- City, county and state studies and publications (population growth, traffic volume, visual surveys)
- Studies done by local firms such as banks or utility companies (projected growth, etc.)
- Books and publications on cost data ("Construction Outlook"
-F.W. Dodge, "Dodge Building Data and Cost," "National Construction Estimator")
- Subscription to services such as "IDAC," "Pattern Language," or "CAD-LAB." (computer programs)
- Weather bureau

- Personal visits and observation
- School district surveys and publications

APPENDIX B.4

White's List of Possible Programming Forms

- Functional matrices
- Sensory production - conflict matrices
- Function - context matrices
- Critical Path diagrams
- Site evaluation forms
- Questionnaires
- Drawings of plans for existing buildings housing client's operation
- Checklists
- Bubble diagrams of affinities, conflicts and sequences
- Furniture inventory forms
- specific space needs form (furniture, electricity, HVAC)
- Code check form

APPENDIX B.5

White's List of Criteria for a Programming Report

- Pre-Programming
- Acknowledgements
- Forward or preface
- Table of Contents
- Purpose of the document
- Scope of the document
- Spirit of the problem (quotes)
- Client identification
- Client background and philosophy
- History of client operations
- General client goals
- Goals of specific project aspects
- General trends in client's field
- Glossary of client vocabulary
- Time schedule and budget
- Project priorities
- Program organization and format
- Programming methodology
- Overall project goals and objectives
- Project status
- Project descriptions
- Reason for the project
- General design philosophy
- General description of client's operation
- Major constraints and limitations

- Analysis of existing conditions
- Facts (see Traditional Architectural Facts)
- Precepts - general explanation
- Site precepts
- Building precepts
- Phasing precepts
- Premises
- Assumptions
- Givens
- Architectural design criteria
- General building systems design criteria
- Mechanical systems design criteria
- Electrical systems design criteria
- Structural systems design criteria
- Building performance (consequence) standards
- Concept alternatives
- Patterns
- Action plan
- Concept aspects (description)
- Evaluation of concepts (advantages and disadvantages)
- Composite evaluation
- Project phasing
- Recommendations
- Review
- General conclusions
- Summary
- Appendix

- Exhibits
- Definitions and glossary
- Index
- Bibliography
- Credits and programming team

APPENDIX B.6

White's Programming Process

PROGRAMMING PHASE:

- Programmer researches background facts: tradition and non-traditional fact checklists established
- Programmer plans procedures for collecting data
 - schedules programming goals
 - outlines data in checklists for collection
 - designs forms and format for recording
 - defines sources for collecting data
- Contact decision makers and agree on programming process, ground rules and responsibilities
- Determine all participant groups involved in client organization
- Collect and organize the outlined checklists of researched facts for distributing to the proper sources
- Identify one representative from each participant group to be the decision maker and spokesperson for their group
- Inform representatives of the procedure for collecting data, their responsibilities, the programming schedule and what is needed from them
- Submit researched checklists to representatives for verification or change
- Programmer identifies data that still has to be collected
- Work with representatives to collect the needed data
- Document data and submit to representatives for verification or change
- Test space needs against budget
- Adjust to balance space and budget
- Submit adjusted allowable space to representatives
- Distill "precepts" for architectural direction
- Review programming decisions with all representatives
- Produce programming report
- Present program to representatives

-Direct program to designer

DESIGN PHASE

CONSTRUCTION PHASE

-Post construction evaluation according to program for
future research

APPENDIX C

APPENDIX C.1

C.R.S. Programming Report Outline

Introduction

- Background
- Work performed
- Participating client groups
- Organization of report

Goals

- Project goals
 - Mission
 - Goals and objectives
 - Policies
- Operational Goals

Facts

- Summary of statistical projections
- Staffing requirements
- User description
- Evaluation of existing facilities
- Site analysis
 - Urban Context
 - Catchment area
 - Vicinity Land Use
 - Views from/to site
 - Location
 - Site Size/Configuration
 - Accessiblity
 - Walking distances
 - Traffic volume
 - Topography
 - Tree cover
 - Building areas
 - Existing structures
 - Land Acquisition Potential
 - Climate Analysis
 - Zoning Regulations
 - Code Survey
 - Cost Parameters
 - Project delivery schedule

Concepts

- Organizational structure

- Functional relationships
- Priorities
- Narrative functional descriptions
- Operational Concepts

Needs

- Space requirements
- Outdoor space requirements
- Parking requirements
- Land requirements
- Project phasing
- Budget analysis
 - Rennovation costs
 - New construction costs

Problem Statement

- Design problem
- Operational problem

Appendix

- Detailed statistical data
- Workload and space projection methods
- Existing building space inventory
- Budget analysis methods
- Glossary

APPENDIX C.2

C.R.S. Programming Process

- Programming team is organized and tasks are assigned for specific design project
- Time schedule drafted for programming procedures
- Programmers determine decision makers
- Provocative words are established; keying each client group
- Programming booklet for client/users produced
- Programmers explain procedures to the decision makers
 - booklet explained and reviewed
 - time schedule reviewed
 - programming process explained
 - the initial budget is determined for testing
 - schedule is set
- Programmers visit new site and document on "analysis cards"
- Programmers visit and record existing conditions of spaces to test new requirements
- Briefing with total group, programming booklets handed out
- "Squatter sessions" prepared in a specific room for convenience
 - "analysis cards" are placed on walls, organized according to information index
 - "brown sheets" drawn to display areas based on cost
- Interviews are made with users groups; one hour each group; 10-20 people/group
 - "analysis cards" and "brown sheets" are revised and updated with new information
 - equipment wanted is listed separately for use in design development phase
- Work session with decision makers
 - evaluate and classify new information
 - balance budget with space
- Presentation prepared into program report on 8 1/2" x 11" format
 - brown sheets are revised with new cost estimate
 - analysis cards state the problem
- Program report complete
- Owner reviews and modifies

APPENDIX D

APPENDIX D.1

Alexander's Partial List of Patterns

The first group of patterns helps to lay out the overall arrangement of a group of buildings: the height and number of these buildings, the entrances to the site, main parking areas, and lines of movement through the complex;

- building complex
- number of stories
- shielded parking
- circulation realms
- main building
- pedestrian street
- building thoroughfare
- family of entrances
- small parking lots

fix the position of individual buildings on the site, within the complex, one by one, according to the nature of the site, the trees, the sun: this is one of the most important moments in the language;

- site repair
- south facing outdoors
- positive outdoor space
- wings of light
- connected buildings
- long thin house

within the buildings' wings, lay out the entrances, the gardens, courtyards, roofs, and terraces: shape both the volume of the buildings and the volume of the space between the buildings at the same time--remembering that indoor space and outdoor space, yin and yang, must always get their shape together;

- main entrance
- half-hidden garden
- entrance transition
- car connection
- hierarchy of open space
- courtyards which live
- cascade of roofs
- sheltering roof
- roof garden

when the major parts of buildings and the outdoor areas have been given their rough shape, it is the right time to give more detailed attention to the paths and squares between the buildings;

- arcades
- paths and goals
- path shape
- building fronts
- pedestrian density
- activity pet
- stair seats
- something roughly in the middle

now, with the paths fixed, we come back to the buildings:
within the various wings of any one building, work out the
fundamental gradients of space, and decide how the movement
will connect the spaces in the gradients;

- intimacy gradient
- indoor sunlight
- common areas at the heart
- entrance room
- the flow through rooms
- short passages
- staircase as a stage
- zen view
- tapestry of light and dark

APPENDIX E

APPENDIX E.1

Palmer's 40 Types of Programs

Ascertainment Program
Forecast Program
Recommended Program
Preliminary Program
Final Program
Master Program
Facility Program
Component Program
Performance Program
Design Requirements
Design Specifications
Design Log
Master Plan
Long-Range Plan
Social Impact Assessment
Economic Impact Assessment
Engineering Program
Feasibility Study/Program
Site Requirements
User Needs Survey/Program
Regional Plan
Site Plan
Community Plan
Neighborhood Development Program
Lighting Program
Interiors Program
Activity Program
Organizational Plan
Goals/Objectives Statement
Service Program
Systems Program
Space Program
Equipment Program
Functional Program
Energy Conservation Plan
Energy Management Plan
Energy Analysis
Operations/Maintenance Program
Cost/Benefit Analysis
Environmental Impact Assessment

APPENDIX E.2

Palmer's Repeated Programming Procedures

- Establish project goals
- Organize programming effort
- Investigate issues
- Integrate data
- Interpret information
- Instruct designer and client
- Evaluate results
- Recycle information

APPENDIX F

Koberg's Collection of Problem Solving Strategies

CARTESIAN ca.1640 (Rene Descartes)	Zero Defects	Identify the defects or errors in a situation	Alex Osborn (1953)	Karl Poppers
Recognize situation	Classify the defects or errors	Trace the causes of defects or errors	Orientation	Begin a briefing of the problematic situation
Decompose situation into component parts	List possible causes of each defect or error; Analyze production process into stages; test each station in production line	Difficulty is located and defined	Preparation	Propose solutions from a broad spectrum of views
	Preparation (information-gathering)	Information	Analysis	Test proposals against criteria formulated (refutation)
Resolve parts	Incubation (unconscious mental activity)	Possible solutions are suggested	Ideation	Select most appropriate or least-refuted proposal
	Illumination (solution emerges)	Solutions are formulated	Incubation	
Resolve entire problem via resolution of resolutions	Verification (solution tested and evaluated for negatives)	Solution is selected	Synthesis	
		Implementation	Verification	

General Electric	Osborn-Parnes (1956)	William JJ Gordon (1961)	M. Asimov (1962)	J. Rossman (1964)	Kepner/Tregos (1965)
Recognition	Examination of problem 'mess'	Problem as given (P.A.G.)	Primary Phase: feasibility	Observation of need or difficulty	Identify the problem
Definition	Finding the 'fuzzy' situation in need of improvement	Analysis	Preliminary design	Recognize and identify the problem	Using prepared checklist, itemize causes of the problem
Search for Methods	Fact-Finding	Purge of immediate solutions		Problem formulated	
Evaluation of Methods	Problem-Finding	Problem as understood (P.A.U.)		Research the problem area: collect, assemble and analyse facts and data	Establish, rank and weigh objectives
Selection of Method(s)	Idea-Finding	Evocative questions to inspire analogical thinking	Detailed design	Option-finding phase: develop a spectrum of solution possibilities	Develop alternative actions
Preliminary design	Solution-Finding	Solutions fantasized from externally discovered relationships	Production Phase: planning	Decision phase: Screen and clarify spectrum of options	Compare objectives with alternatives; determine best action and test selected action for negative consequences
Interpretation of results	Acceptance-Finding	New viewpoints are discovered and developed	Planning for distribution	Relate and combine similar options where possible	Account for negative consequences in final action
Detailed solution: implementation			Planning for consumption	Test options against improved ideas criteria	
			Planning for retirement	Develop 'sales' plan to explain tested decision	
				Gain acceptance and implement	
				New ideas are tested	

Attribute Lists (Crawford)	Work Simplification	Operations Research (C.W. Churchman)	Program Evaluation Review Technique (P.E.R.T.)	L.B. Archer, London Design Council	Design Methods Conference, London- 1962
List attributes of object to be improved	Select a job to improve	Identify the decision makers	Define objectives of overall project	Define goals	Analysis: Classification of random factors involved Sources of information Interaction of facts
Systematically examine each of the attributes in search for modification possibilities	Get the facts	Determine objectives	Develop a task network	Establish crucial issues	Performance Specifications Obtaining agreement between factors
	Challenge the facts; list possible solutions	Determine courses of action possible: Identify variables and controls over variables; formulate new areas of research	Estimation of time/task relationship	Collect data	Synthesis: Creative thinking Partial solutions Combined solutions Determining limits
		State of problem		Analysis	Evaluation: Sales Operations Manufacture
	Analyse and select independent variables within problem area	Understand problematic context; Analysis of problem areas		Synthesis	
	Develop sub- classifications for each independent variable	Determine communication paths; Analyse needs and identify 'triggering' needs; Analyse information flow within system		Development	
	Construct a matrix having a 'cell' for each interrelationship between sub- variables	Develop measures for assessing outcome: apriori measures from logical reasoning and aposteriori measures from experience (Use efficiency and effectiveness tests in decision-making)	Solution of problems uncovered	Communication	
John Arnold	Implement improved plan		Develop a new network		
Develop a hypothetical situation with many unusual conditions					
Use situation as stimulus to develop practical answers					

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