

PROBLEM DEFINITION IN ARCHITECTURE  
AND ITS EDUCATIONAL IMPLICATIONS

by

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June, 1971

SUBMITTED IN PARTIAL FULFILLMENT  
OF THE REQUIREMENTS FOR THE  
DEGREE OF MASTER OF ARCHITECTURE  
IN ADVANCED STUDIES  
at the  
MASSACHUSETTS INSTITUTE OF  
TECHNOLOGY  
June, 1975

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## ABSTRACT

The purpose of this thesis is to investigate the concept of problem definition, particularly as it applies to architectural design problems. Special emphasis is given to its importance in the education of future architects.

The thesis has two parts. In part one, an attempt is made to understand and develop hypotheses about what the nature of problem definition process is and how it could be taught to students. In the second part, the implications of such hypotheses for architectural educational reform are examined.

To develop the hypotheses (below), theoretical constructs and models from other disciplines were examined, my experiences as a student and practicing architect were re-examined, and I interviewed practicing and teaching architects about their experiences.

My hypotheses are:

- the presence/absence of a sense of accomplishment/frustration is a good guide for knowing when the architect has defined the problem well.
- the level of a sense of accomplishment/frustration is a good guide for knowing how well the architect has defined the problem.
- the architect's attitude, behavior, and practices toward uncertainty makes a difference towards whether, when and how he feels the sense of accomplishment/frustration.
- these attitudes, behavior, and practices can be taught.

The implication of the hypotheses is that since the lack of understanding of the problem nature is due to the architect's attitudes, behavior and practices, to teach problem definition is to teach the student the appropriate attitudes, behavior and practices appropriate for different episodes.

Teaching and learning of these attitudes and behavior involve a change of present practices and assumptions. For a change to take place and stay maintained, the student must have a high level of dissatisfaction with present practices, and he must have a clear picture of the desired practices and of the practical first step to the desired state.

Consequently, the structure of architectural courses should begin in a phase directed at increasing the student level of dissatisfaction with his present practices.

When the level of dissatisfaction is sufficiently high, he should then be presented with a picture of the desired attitudes, behavior and practices as the second phase. In the third phase, the instructor should demonstrate how the desired behavior could be practiced. This demonstration will provide the student with the practical first step.

Architecture instructors will need to be good process demonstrators. Training programs for architectural instructors will facilitate the change process.

ACKNOWLEDGEMENT

I wish to acknowledge the assistance of Bill Southworth, Julian Beinart, Gary Hack, Tunney Lee, Weldon Pries, Edward Allen, Fuz Edal, Dennis Frenchman, Jan Wampler, Charlotte Noble and Barbara Levy and my family gave me while writing this thesis. This assistance made the writing of this thesis possible.

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## INTRODUCTION

When I was practicing architecture in Nigeria, certain things did not work out for me in some instances; for example, the "Z" high school case presented in Chapter Two. I noticed that the situation was similar to the Schokbeton vs. Ghana Government case (also presented in Chapter Two). Here at M.I.T. I interviewed some architects and discovered that they had had similar experiences. Moreover, during this interviewing process, a pattern began to emerge: that architects have tended to be less effective in some problem situations/professional work settings because they have designed for the wrong problems. Their approach attempted to transfer ready-made solutions from one problem to another, thus overlooking the fact that problems are situational.

It is my hypothesis that the origin of this pattern lies in the term "situational". That is, the architectural problems confronting us are "situational" not only because of their tangible/concrete elements, but also because of their existence in a temporal setting. Former, successful solutions of yesterday work ineffectively today. I feel that there has been a change in the work setting and that this setting will continue to evolve. The goal of my thesis, therefore, has been to develop a process, problem definition, that will equip future architecture students so that they can adapt to the changes of tomorrow.

### THE CHANGING WORK SETTING OF ARCHITECTURAL PROFESSION

In the past, and up until quite recently, most architects who were trained as designers were accessible to only a few rich clients who

could afford their services. The rich clients were also the users of the buildings and could explicitly describe what type of building design they wanted. Consequently, the architect had a simplistic work setting. Thus, it was comparatively easy for the architect to communicate to his clients about the merits of his design ideas.

But today, this work setting is changing very fast. It is becoming more complex. The architect no longer works for single clients alone. In most cases, the clients and the users of the buildings he designs are different people, and have different perceptions of the problem.

Today, many more clients can afford the services of contact-clients (i.e., architects and other professionals) to supervise and evaluate the consulting architect's design proposals. In this work setting, the architect must have a good understanding of the problem and be explicit about it before he can produce appropriate designs and effectively convince his clients about his design ideas.

#### THE NEW DEMANDS OF THE NEW WORK SETTING

In the simplistic work setting, architects emphasized design as an artifact. This was appropriate because the design problems were often well-defined by the rich clients who were the users themselves. Consequently, design could proceed immediately after the clients' brief had been drawn and designed.

But in the complex work setting, the drawing up of a client's initial brief does not immediately put the architect in the position to solve the problem. It also does not put him in the position to consider the design solution information he will collect, the method

he will use, how he will analyze the information and how he will design with this information to meet his client's needs. This is the case because design is influenced by many factors which the client might be unaware of, or if he is aware, he may not tell the architect.

In some work settings, the main clients are resourceful enough to employ the services of contact-clients (architects and other professionals) to supervise and evaluate the consulting architect design proposals. Between the main-client and the contact there could be a range of intermediate clients. The main-client, intermediate and individual contact-clients could have hidden conflicting assumptions and perceptions of the problem.

Thus, the architect must first define what the problem is or re-define the problem as it was given to him so as to have sufficient understanding of the design implications. Thus, problem definition is the first step in design as problem definition is in a scientific inquiry. This is not to say that the whole of the design is a scientific procedure. But rather, that the problem definition stage of design is characterized by the requirements of a scientific procedure, and also has scientific properties.

As in scientific inquiry, there are no foolproof techniques which guide the architect in defining problems. Here the architect's ability, acquired through training and his ability to manage problem definition processes are very important.

The need, therefore, to emphasize problem definition and to do it (problem definition) well cannot be over-stressed. This need is even

greater because the quality of problem definition goes a long way to influence the quality of the solution the architect produces. A well-defined problem is to a good architect in a complex setting as a good brief is to a good 'traditional' architect in a simplistic work setting. The traditional architect in theory is defined as an architect who sees design as an artifact alone and deemphasizes the scientific process consciously or unconsciously. The complexity has also exaggerated the problem but the need for good problem definition has been there all along.

#### INADEQUACY OF ARCHITECTURAL EDUCATION

Unfortunately, the architect today is a poor problem definer. This could be inferred from the very poor quality of our present environment and from the numerous unsolved architectural problems. Many factors are responsible for the above situation. Among these is the lack of emphasis architectural education places on problem definition. This is because most schools of architecture do not fully recognize its importance as a process; do not emphasize and teach it.

There are, therefore, the needs to:

- 1) introduce the idea of teaching it as a process in architectural education, and
- 2) to develop and modify curriculum and pedagogy accordingly.

#### MY MOTIVATION AND MY OBJECTIVES

The insight to these needs and the opportunities (listed below) that they offer me motivated this thesis; a) an opportunity to investigate in an exploratory way, problem definition in architecture, to

understand it, and to develop means of communicating it; b) an opportunity to acquire sound theoretical bases on which to guide the change in architectural education in Nigeria; c) this theoretical base can be achieved by investigating the educational implications of problem definition; and d) an opportunity for giving a meaning to the vast theoretical background courses I have been exposed to at M.I.T. and Harvard.

#### THESIS GOALS

These objectives were met through an inquiry in the following directions: Part One of this thesis delves into:

- How do you do it (problem definition)?
- How do you teach it (problem definition)?

The goal in this inquiry is to understand what problem definition is, form a hypothesis about it which will be tested at a later date.

In Part Two of this thesis, the implications of the hypothesis for architectural education were considered in terms of:

- a general thesis
- curriculum and pedagogical reform
- training of architectural teachers as a practical first step to change.

#### THESIS METHODOLOGY:

Information for both parts one and two was drawn from the sources found on the following page:

Personal Experiences	Practicing Architects	Architecture Education	Literature
Reviewed cases from experiences a) as a student of architecture in Nigeria. b) practicing architecture in Nigeria. c) teaching in a school of architecture in Nigeria d) as a student again at M.I.T.	a) interviews with architects practicing in Cambridge b) Schokbeton firm vs. Gov't of Ghana case history.	a) observation of a design studio. b) observation of a course - special problems in architecture.	a) about architecture education. b) architecture practice c) problem diagnosis and solving in social science research, medicine, engineering, law, mechanics, police/detectives.

#### INTERVIEW METHODOLOGY

##### Type of Interview:

The type of interviewing used was - focused, subjective and questions based on some critical incidents in the respondent problem definition experience.

##### Choice of Respondent:

In all, seven architects were interviewed. Each of these architects has been involved in problem definition situations before. Four of the seven are teachers and have been known to have consciously or by implication taught problem definition to students.

##### Preparation for Interview:

I had previously analyzed some hypothetically significant elements, patterns, processes, structures of problem situations and problem definition. Through some situational analysis I arrived at a set of

critical questions for an exploratory research. On the basis of these analyses, I developed an interview guide - questions (see Appendix) setting forth the major areas of critical incidence. The interview was focused on the subjective experiences of the respondents. From the responses to the interview, a hypothesis has been developed which should be tested more rigorously.

Interview Guide:

In the interview, the respondents were free to explore reasons, motives, to probe further directions that were unanticipated. My main function in the interviews was to focus the respondents' attention upon their own experience.

STUDIO AND NON STUDIO COURSE OBSERVATION

Observations of the studio and non-studio course were directed at filling up the table below:

	Design Studio Course - Level III	Seminar on Special Problems in Arch.
Content Description		
What is the meaning of the course?		
How was the problem definition process used?		
How could it be used?		
Suggestions for improvement in the use of problem definition-solving process.		

Information obtained from these observations were used specifically to demonstrate how problem definition could be used to reform curriculum and pedagogy.

#### DATA ANALYSIS

The data obtained was analyzed specifically to answer in a hypothetical way the thesis questions in Chapter Three.

First, the critical elements (i.e., the forces) in each of the interview respondent's problem definition process and style were identified.

This episode was followed by another which compared the identified forces in relation to problem setting and problem definition style.

A forcefield analysis of the identified forces was attempted.

Connections were made between the forces to develop my viewpoint about the thesis questions.

PART ONE

CHAPTER ONE

INTRODUCTION

This first chapter focuses on

- defining the terms used in this thesis  
and in
- developing models of (1) a well defined problem and  
(2) models of problem definition processes from the  
observed patterns mentioned in the introduction of  
this thesis.

The process for developing these models was simple. First, the elements of the observed patterns were identified and then, a viewpoint (model) was developed by "making connections" between the identified elements. (See Appendix)

DEFINITIONS

Problem solving as a process very often means and includes problem definition as a first step. Where one is distinguishing between the two, one must clearly define what one means by both terms.

THE TERM 'PROBLEM DEFINITION'

Problem definition is the process by which one attempts to explicitly explain and understand the nature of a particular problem in order to solve it/evaluate a solution.

THE TERM 'PROBLEM SOLVING'

Problem solving is the process by which one defines and resolves a problem to fulfill specified objectives and goals.

## THE TERM 'DESIGN' IN ARCHITECTURE

A design as a process is the process by which one defines, solves a problem and embodies the solution on paper.

Design as an artifact includes ' the arrangement of the basic elements, both material and conceptual, that comprise a man-made object of any kind.'

## A MODEL/THEORY OF A WELL DEFINED PROBLEM

This model/theory was developed from the observed pattern - architectural problems are situational. That is, a behavior/object is a problem due to its context. For example, a particular technique of an industrialized building system might be seen by person "A" as a problem in "X" country (unindustrialized) and as a breakthrough in "Y" country (industrialized). Another observer, "B" might see the same technique of an industrialized building system in juxtaposition, i.e. he sees it as problematic in "Y" country (industrialized) and as a breakthrough in "X" country (unindustrialized). Therefore, we must specify a problem in terms of its context in order to understand it.

Although the elements of a problem context are many, they can be classified into three broad categories, viz. environment, others and self.

## THE ENVIRONMENT

- This includes things of non-personal nature, e.g. site, budget, building codes. Investigations to determine the environment in which

a problem is situated give rise to the question - 'in what context?'

#### OTHERS

- things that have to do with other people, e.g. client, users.

Investigations to determine the person gives rise to the question - 'for whom?'. These things are needs, expectations, aspirations, operational objectives, purpose, etc. Investigations to determine them give rise to the question - 'for what?'.

#### SELF

- things that have to do with me as an individual (architect).

These things are the type of solution, cost of defining the problem.

#### TYPE OF SOLUTION

We know that people perceive problems differently and emphasize different sub-problems and solve these problems differently. Therefore, when a client comes to an architect, he has partly determined his solution. Investigation to determine how one solution affects a problem gives rise to the question - 'how?'

#### THE COST OF DEFINING THE PROBLEM

Problem definition is expensive because information gathering is costly. It involves physical, economic and human cost. Consequently, the architect always has to balance out what one is collecting with the value one gets from it. The balance affects the quality of the problem definition. The quality of problem definition goes a long way to affect the quality of the solution. And, both the quality of problem definition and solution affect the problem.

### THE NATURE OF THE PROBLEM

Problems do not exist in isolation. A main problem comprises many sub-problems. Classification of a problem as 'main' or 'sub' depends on the relative emphasis you give to it. The term, 'nature of a problem' refers to the dynamic and interaction order and arrangement of all its related sub-problems. Investigations to determine the nature of a problem give rise to the question - 'why', or 'why is the problem what it is?'.

### THE IMPLICATION FOR PROBLEM DEFINITION STATEMENT

A comprehensive problem definition statement should therefore comprise the following statements:

- statements about the environment/context
- statement about self and others.
- statements about the problem nature
- description about the solution needed
- statement about the cost of defining the problem.

A comprehensive inquiry should ask the following questions:

- for whom?
- for what purpose?
- in what context?
- why?
- how
- cost

### THE IMPLICATIONS FOR A WELL DEFINED PROBLEM

The goals/objectives of problem definition are:

- to design a problem evaluation criteria so explicitly that when one sees a solution idea, one will know it.
- to maximize the positive consequences (economic, physical and human cost) of change.

The underlying assumption here is that problem solving involves a change process.

- to balance the cost of defining and solving a problem with the value one gets from solving the problem.

Since the practical objective in the design of a problem definition process is to balance out the resources used with the values we get from it, we can therefore write a model as shown below. It is my hypothesis that this model can help us to know where we are in a problem definition process. The model can be expressed as follows:

$$PD_w = \left[ \text{(WHY) (FOR WHOM) (FOR WHAT) (HOW) (C_+)} \right] > \left[ \text{(C_{pd}) (C_-)} \right]$$

C<sub>+</sub> = positive consequences

C<sub>-</sub> = negative consequences

C<sub>pd</sub> = cost of problem definition

In other words, for a problem to be well defined, there has to be enough knowledge about:

- (1) the problem nature - why?
- (2) the environment - in what context?
- (3) others - for whom?
- (4) the purpose - for what?
- (5) both the positive and negative consequences of the action C<sub>+</sub> and C<sub>-</sub>.

(6) cost of defining the problem and solving it.

Thus, for an architect to define a problem well, the architect needs to be knowledgeable about the conditions which do not exist or do exist in high strength. Any of these conditions absent provides a clue as to where the architect should put more energy in defining the problem or designing a problem statement.

For example, if the architect does not have enough knowledge about 'for whom?', 'for what?', 'in what context?', 'how' and both the positive and negative consequences, then he should direct his energy towards increasing his understanding of the problem nature - 'why'.

Furthermore, if the architect does not have enough knowledge about the problem nature ('why') but does have enough knowledge about 'for whom?', 'for what?', 'in what context?', 'how', and both positive and negative consequences, then he should direct his energy towards increasing his understanding of it (why).

On the other hand, there may be a high knowledge about the 'why' but not clear understanding of 'for whom?', 'in what context?', 'for what?' and 'how?', and in this case the architect should concentrate his energy in identifying them.

If both of these conditions exist but the knowledge of the consequences and the practical first step ('how?') are absent, then the problem definition process should be directed toward it.

But how do you know when you don't have enough of each item?

Chapter Three attempts to answer this question tentatively.

## MODELS/THEORY OF PROBLEM DEFINITION PROCESS

In the first half of this chapter a tool for examining problem statements was introduced. In the second half, another tool (3 models) is introduced for examining the process for defining the problem statement. The three models have been derived by "making connections" between the elements of the observed pattern, (i.e., that architects have tended to be less effective in some problem situation/work settings because they have solved the wrong problems). These elements have been identified by comparing 1) general statements of problem definition with problem definition in architecture and 2) problem solving as a process to problem definition as a process.

COMPARING GENERAL PROBLEM DEFINITION PROCESS (clinical, mechanical, detective) METHODS AND  
PROBLEM DEFINITION IN ARCHITECTURE

GENERAL STATEMENT OF PROBLEM DEFINITION

Problem definition begins with a problem statement. The process comprises:

- 1) identification of problem elements
- 2) making connections
- 3) solving the problem tentatively
- 4) testing the solution
- 5) iteration of the above (redefining the problem)

PROBLEM DEFINITION IN ARCHITECTURE

Problem definition in architecture begins with a brief. The process is the same and comprises:

- identification of problem elements
- \*making connections between identified problem elements to develop viewpoint about the problem nature.
- solving the problem tentatively
- testing the solutions
- iteration of the above (redefining the problem)

(see diagram)

Footnote:

- \* The term 'making connection' means developing theories, principles, and/or models about the problem nature.

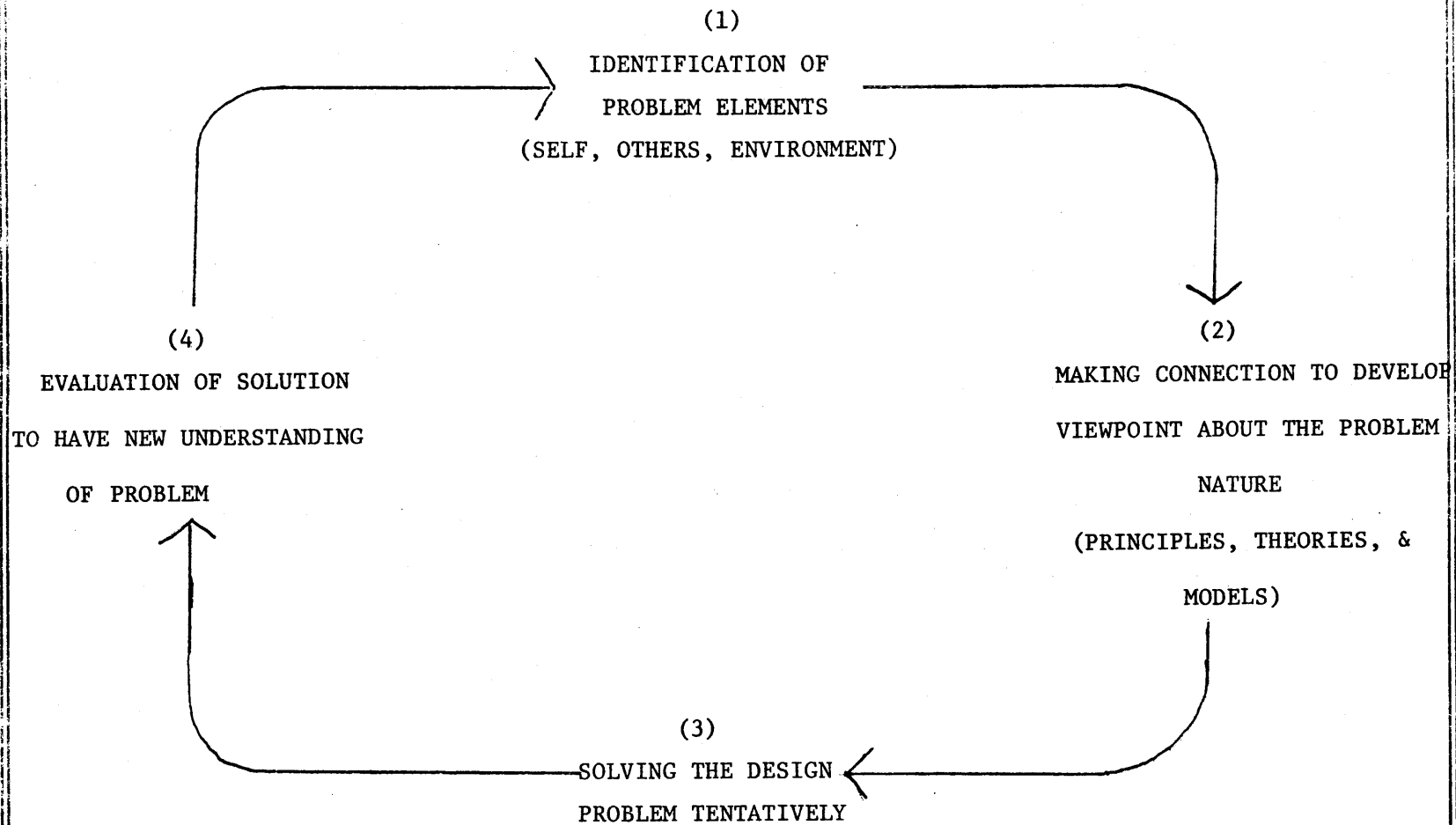
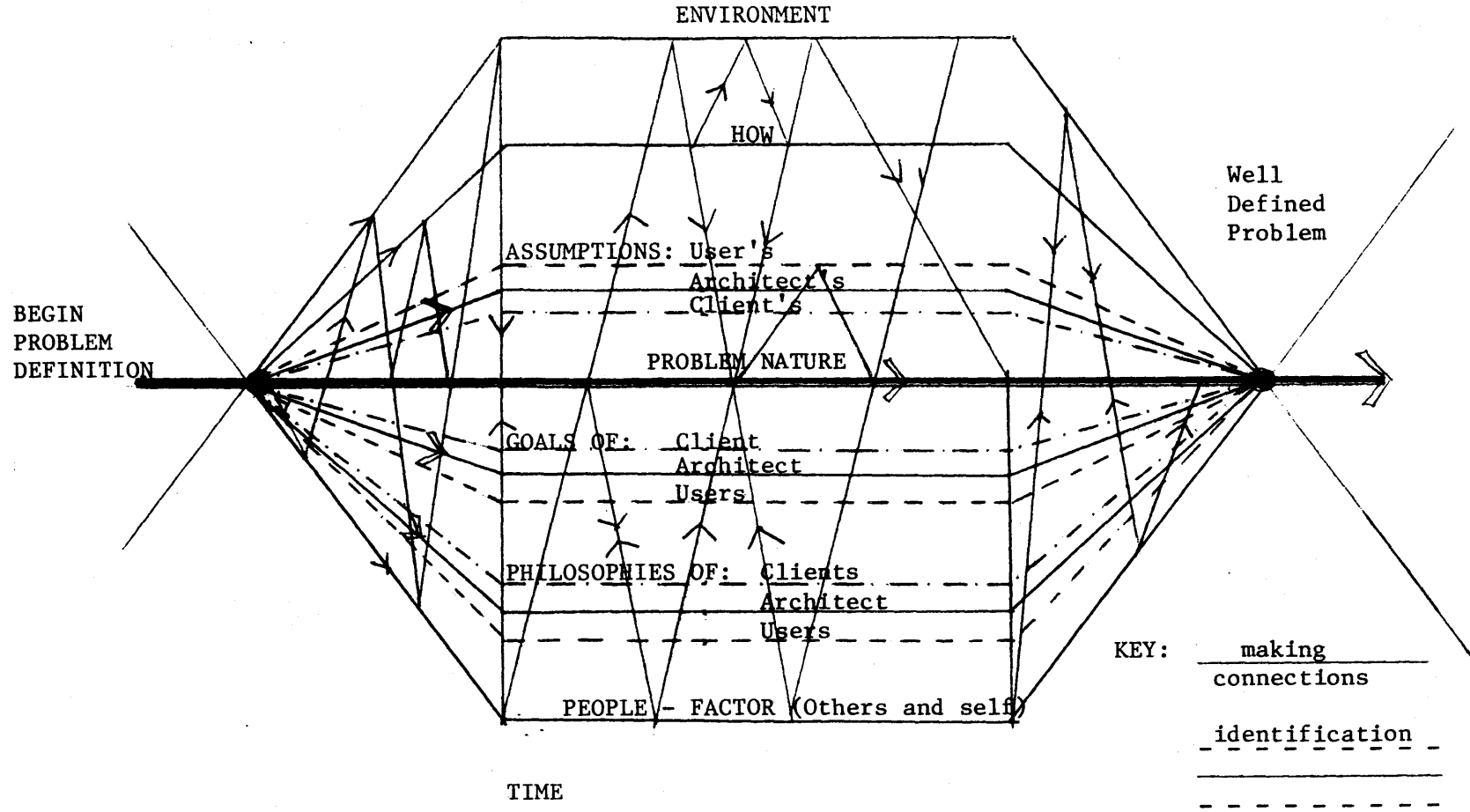


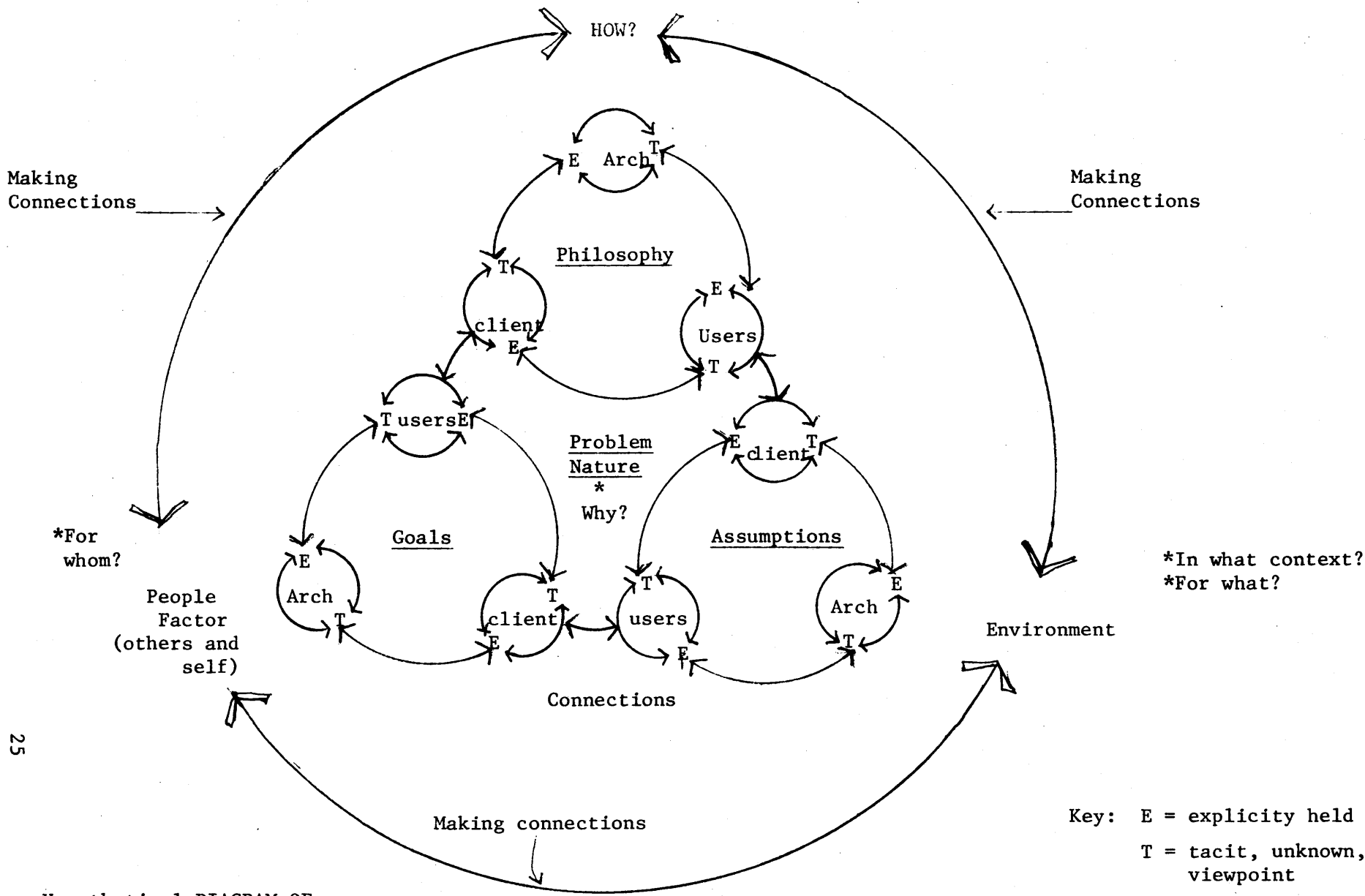
DIAGRAM OF PROBLEM DEFINITION EPISODES



Hypothetical FLOW DIAGRAM OF PROBLEM DEFINITION PROCESS

KEY: making connections  
identification  
 -----  
 -----  
 -----  
 and analysis.

NOTE: These factors may not flow so nice and neatly as they do here.



Hypothetical DIAGRAM OF PROBLEM SETTING

IDENTIFICATION OF PROBLEM ELEMENTS

In this episode, the problem definer identifies:

- 1) self
- 2) others
- 3) environment

or

'for whom?'

- 4) 'for what?'
- 5) 'in what context?'
- 6) 'how?'
- 7) the consequences of the problem

IDENTIFICATION OF PROBLEM ELEMENTS

This episode involves identifying:

- self = architect
- others = client, users, contractors
- environment = site, budget, building, codes

or

for whom = client, user

- for what = needs, function
- for what context = site, budget, building codes
- how = type of solution
- the positive and negative consequences of the problem.

In complex work setting, the goals, assumptions and theories held by individual clients may be hidden, inconsistent and in conflict.

Therefore, the architect in this stage of

problem definition should focus his attention at uncovering the hidden and unknown goals, assumptions and theories held by the clients, users, and self.

These hidden and unknown goals, assumptions and theories can be uncovered by the architect by:

- 1) questioning observed patterns
- 2) comparing observed patterns to familiar ones

Known variations of these two basic methods are:

- a) synectic/forced relationship method
- b) case history method
- c) morphological method

(See Appendix for their descriptions.)

MAKING CONNECTIONS

This episode involves making connections between the identified elements to develop a viewpoint about the nature of the problem.

MAKING CONNECTIONS

This episode involves making connections between the identified elements. Its essence is to develop a viewpoint (principles, theories, and models) about the problem nature. In this stage of problem definition, the architect establishes criteria for evaluating solutions and redefining the operational objectives. This stage makes the problem familiar.

The basic element of this process is synthesis.

The known methods of making connections are:

(1) brain storming, (2) synectics, (3) manipulative verbs, (4) use of case history, (5) attributive analogy.

(See Appendix)

SOLVING THE PROBLEM TENTATIVELY

Problem solving is not a simple and straight

SOLVING THE PROBLEM TENTATIVELY

This process involves:

forward process. It involves as a first step connection breaking. That is, you break the connection between the familiar problem and context and make new ones between the familiar problem and a strange context. Known methods for problem solving are by (1) searching for analogies and (2) searching for metaphor.

1) breaking the connections made in the preceding stage. This is necessary because when one is defining a problem, he is making connections in order to make a strange problem familiar. However, in innovative problem solving, one is making a familiar problem strange by putting it in a new context and making new connections. Consequently, making these new connections require that one breaks the old connections first.

2) in this episode the architect takes action:

- to rearrange the environmental elements - site, budget, materials, spaces, etc.
- to redistribute the client's resources, materials, etc.
- to change the status of one or more of the environmental elements or a combination of

of any of the above.

By so doing, he makes new connections between a familiar problem and a new context.

The viewpoint the architect develops in this stage is called design concept and should be completely tentative.

Known methods for problem solving are

- 1) searching for analogies
- 2) searching for metaphors
- 3) trying partial solutions
- 4) detailing

(See Appendix)

#### EVALUATION

In this stage, the tentative solution is evaluated to confirm/disconfirm the viewpoint developed in the preceding stages. In this stage, a new understanding of the problem

#### EVALUATION

The design concept developed in the preceding stage is evaluated to confirm/disconfirm the assumption about the problem nature. Consequently, a new understanding of the problem is

nature is developed. It involves making connections between the connections in the preceding stage to the evaluation criteria designed in the connection making stage.

#### REDEFINITION OF THE PROBLEM

The problem is redefined in light of the new information until the problem has been well defined.

developed.

The evaluation process involves testing the concepts with clients, by building models, reflecting, etc.

#### REDEFINITION OF THE PROBLEM

Cycles of iteration of problem defining and solving are carried on until the problem has been well defined. But, how do you know when you have well defined a problem? (Chapter Three provides a hypothetical answer to this question) But what is the distinction between the problem solving episodes of problem definition process and problem solving process?

THE OPERATIONAL DIFFERENCE BETWEEN PROBLEM SOLVING IN PROBLEM  
DEFINITIONS STAGE AND PROBLEM SOLVING IN DESIGN

Problem definition does not take place in isolation from the other stages of design process. (See definitions of problem definition, problem solving, and design.)

At this point, it is necessary to point out the operational differences between the problem solving in problem definition and problem solving as a process. The difference is that the former assumes total uncertainty\* and its goal is to minimize the uncertainty whereas problem solving as a process values minimum uncertainty and involves making concrete decisions. Therefore, the distinction is the difference of attitudes and behavior and practices of the architect.

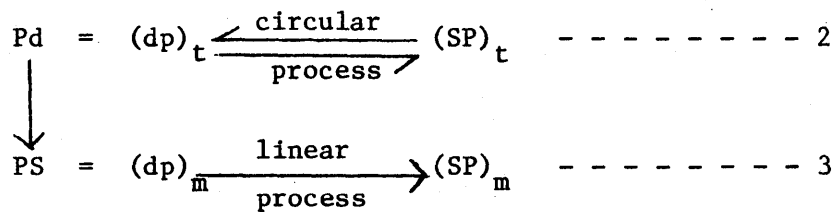
Although this difference is subtle, it goes a long way to -

- 1) affect the structure of our design processes
- 2) affect the management of our problem definition process
- 3) our ability to identify all the facts of a problem situation
- 4) our knowledge and understanding of the problem, and
- 5) the quality of our design solution

---

\* It is a fact (perhaps not) that people cannot operate on total uncertainty. They have to have some concrete base from which to take off. Therefore, what I am saying is that the architect should be highly motivated to continuously test that base for validity and consistency in light of new contexts and information unfolding.

Thus, the major difference between problem definition and problem solving is the degree of uncertainty which is appropriate to adopt in each stage of design - the former requires total uncertainty while the latter requires minimum uncertainty. This difference can be represented conceptually as:



where:

Pd = Problem definition process

PS = Problem solving process

$(\text{dp})_t$  = Describing a problem with total uncertainty

$(\text{dp})_m$  = Describing a problem with minimum uncertainty

$(\text{SP})_t$  = Solving a problem with total uncertainty

$(\text{SP})_m$  = Solving a problem with minimum uncertainty

Therefore, if an architect adopts minimum uncertainty for problem definition,,his process automatically changes to a problem solving process. It amounts to solving a problem prematurely.

On the other hand, if the architect adopts total uncertainty in his problem solving, he automatically changes the problem solving stage to a problem defining one.

Problem definition processes which assume total uncertainty are cyclic while those which assume minimum uncertainty are linear in

structure. Therefore, the degree of uncertainty assumed in the different stages of design affect the structure of the design process of the architect. Consequently, the structure of a design process is symptomatic of what happens internally.

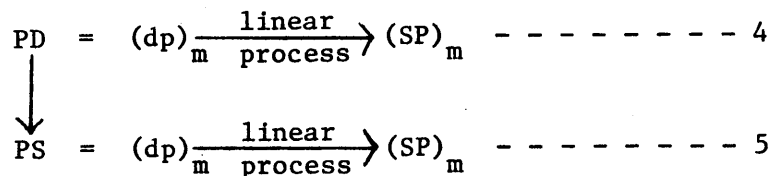
STRUCTURE OF DESIGN PROCESSES

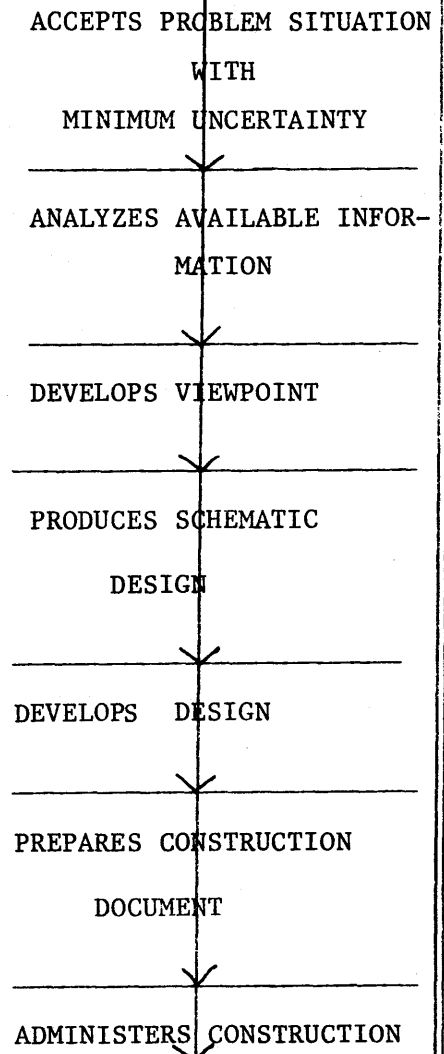
An analysis of the effect of the degree of uncertainty on design structure results in three models of design processes.

MODEL ONE

In model one, the architect begins his design process with minimum uncertainty, accepts completely the information he has about the problem situation without questioning it. He then analyzes the information, develops a viewpoint, produces schematic design. develops the design, prepares construction documents and administers construction on the basis of his initial acceptance of the problem situation. Thus, the model one architect does not ask the question, 'why?'. His efforts are directed to the question, 'how?'. His process is linear and characterized by abrupt beginnings and ends of different episodes and stages. His design structure is made linear by the adoption of minimum uncertainty in all the stages of the design. That is, the problem definition process has been converted to problem solving.

MODEL ONE A

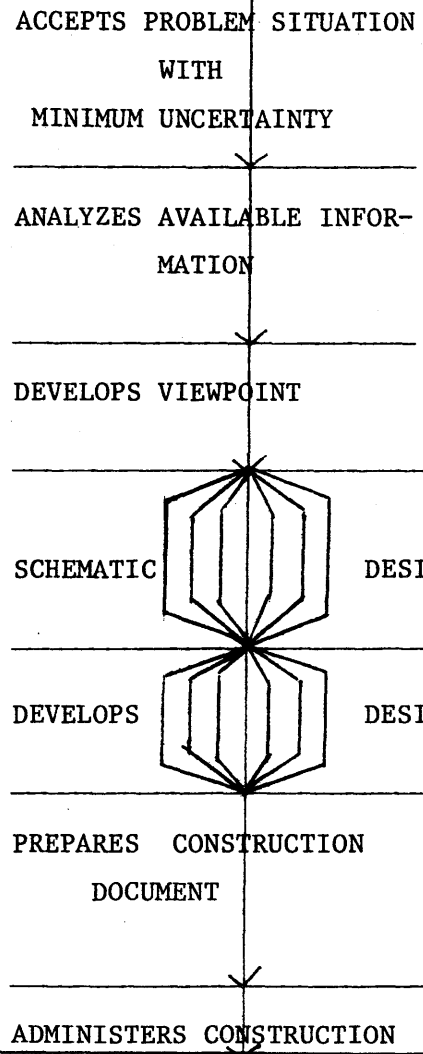




model one diagram.

MODEL ONE B

The difference between this and model one is that during the schematic design and design development stages, alternative design solutions are simultaneously, but independently developed and then evaluated one against the other by colleagues, clients, and users.

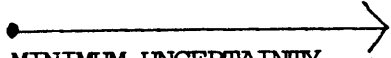


model one B diagram

ACCEPTS PROBLEM

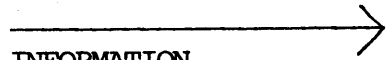
SITUATION WITH

MINIMUM UNCERTAINTY



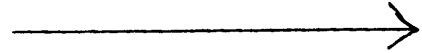
ANALYZES

INFORMATION



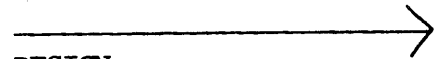
DEVELOPS

VIEWPOINT



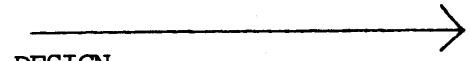
SCHEMATIC

DESIGN



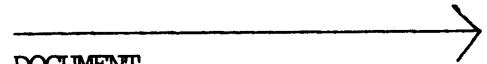
DEVELOPS

DESIGN



CONSTRUCTION

DOCUMENT



CONSTRUCTION

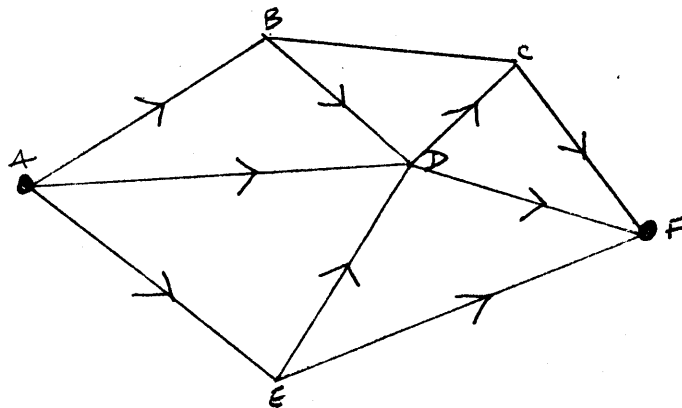
ADMINISTRATION



model one C

MODEL ONE D

Model one D variation involves a detailed breakdown of the problem into sub-problems and not into episodes and stages of problem definition and solving as in the above models. For example, a firm of architects might break up the design problem into such categories as foundation, structure, spaces, floors, air conditioning, etc. and assign different architects to handle each sub-problem. This variation relies on partial knowledge of the problem and solution. Careful pre-planning, rigid control and elaborate liason work characterize this model.



Key

A, B, C, D, E are the design sub-problems different architects are handling.

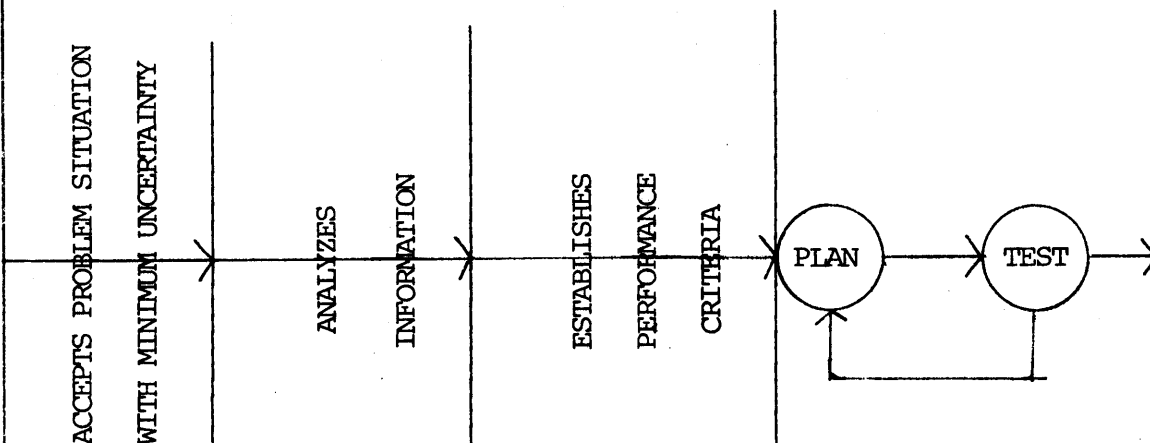
model one D diagram

## MODEL TWO

In model two, the architect begins his problem definition with minimum uncertainty and then proceeds to adopt high uncertainty in the problem solving stage. Consequently, we have linear beginning (he accepts the problem situation completely, analyzes the information he has and establishes performance criteria) and cyclic problem solving and testing process. Like model one, the model two architect does not ask the question 'why?' in problem definition stage.

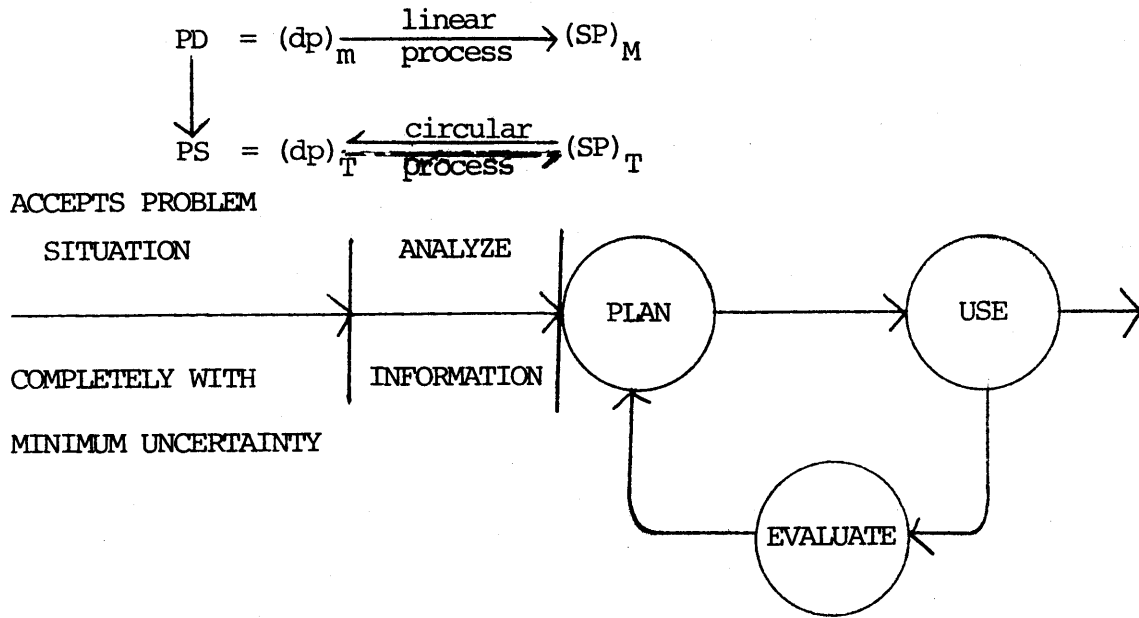
The cyclic process involves a constant feedback system - where one progresses by constant feedback relationships. This process makes use of the presence of very fixed performance criteria against which successive design alternatives are measured until one solution satisfies the criteria. It is important to note that the performance criteria is fixed because of the minimum uncertainty the architect adopts at the problem definition stage.

model two diagram



MODEL TWO B

The variation in model two B is that design is a series of cycles of events over a period of time. It requires that part of the building or project be built, evaluated and, after a period, plans are updated or new plans are made to complete the project.

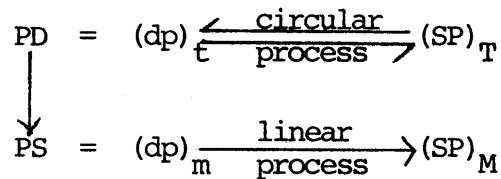


model two B diagram

MODEL THREE

The architect in model three adopts total uncertainty of the problem nature from the onset. His goal is to minimize the uncertainty in the problem solving stage. Model three is therefore a problem defining-solving reiteration design process. By so doing, it improves the processes for defining and solving by finding faults in the previous process with each reiteration of the processes. It is only after the reiteration processes, when a sufficiently good problem definition

and problem solving mechanisms have been developed, that design decisions will be made.



Model one architects have always loved to do their practice in the area traditionally labeled 'design - as an artifact'. This area excludes the process dealing with 'why' questions and concentrates on 'how'. Consequently, such architects are effective only in the simplistic work setting.

Model two architects value exploratory problem solving. Thus, like the model one architect, they confine themselves to the problem definition stage, to the neutral position 'how'. Like the model one architect, the model two architect excludes the question of 'why'. For a model two architect to be effective in a complex work setting, he should be presented with a problem situation where all the facts about it have been identified and are readily available.

Thus, a model one architect's inadequacies point out the importance of:

- 1) process in problem definition and solving, and
- 2) identifying all facts about a problem situation.

On the other hand, a model two architect's inadequacies point out the importance of identifying all facts about a problem situation.

In Chapter Two the inadequacies with models one and two will be demonstrated.

## CHAPTER TWO

The case, 'Z High School project', has been presented to point out the importance of process and the importance of the ability to identify all elements of a problem situation in defining a problem and solving it.

Another case, 'Schokbeton vs. Ghana', has been presented to point out the importance of improper management of problem definition process. In both cases, the solutions produced were for the wrong problems.

### THE Z HIGH SCHOOL PROJECT

The case began when a state government in Nigeria contracted a firm of architects to diagnose and solve the environmental problems of Z High School. The architects operated in the model one mode of practice, which is inadequate to handle the hidden priorities of his clients and his own dilemmas. He prescribed solutions which turned out to be arbitrary and irrelevant to the problem of the school. This irrelevance was consequently known to the clients and users who abandoned the solutions of the architects. The architect's contract was immediately terminated.

The cliental system comprised the following group of people:

- A state government's ministry of education - the main client who paid the professional fees of the architect.
- The school board - Z High School intermediate client the architect was directly accountable to.
- The building committee appointed by the school board to act

as contact client.

- The building committee appointed by the school board to act as contact client.

- The users - students, faculty who were not represented.

- Communities (temporary and new) in which school was to be located.

#### PROBLEM SETTING

The problem setting comprised the following:

- 1) that the ministry and the school board had hidden goals and priorities and they differed. Furthermore, the architect's own skills in diagnosing such problems are insufficient, i.e., his approach (model one and two) did not include getting at these hidden goals and priorities.

- 2) the environmental problems themselves.

#### THE MINISTRY'S HIDDEN GOALS AND PRIORITIES

After the colonial rule, Nigeria found that she had very few schools to educate her fast growing population and that she had to rely on temporary school buildings.

A decade after independence, a state government felt the need to upgrade the environmental quality of some of the high schools in its capital city.

Accordingly, it contracted some firms of architects to aid the high schools in defining their environmental problems and propose design solutions to solve them.

However, in the contractual arrangement, the ministry did not

disclose all of its goals and priorities of the program. It also did not disclose the extent to which it was willing to be committed financially for the execution of the program. In terms of problem definition, these pieces of information would have helped the architect see what the problem involved was and how to solve it adequately. He would have gotten at least some of this information of the model of problem solving including a teasing out of hidden goals and priorities.

The hidden goals of the ministry as was disclosed after the contract was terminated were:

- that it wanted the architect to explore the possibility of innovative vertical expansion of the school building using locally available materials and dispersed site expansions.
- that it was only willing to be committed to spend \$90,000 maximum for each school for five years and after which the program would be reviewed.

#### HIDDEN PRIORITIES OF THE SCHOOL BOARD

As the ministry did not disclose its goals and priorities, its program was open to subjective and unintended interpretations. The school board did exactly that. It interpreted the ministry's program in light of its long standing goals.

It saw the ministry's program as an opportunity to fulfill its goal of building a gradeous environment and to use the temporary site for building a new place of worship.

Subsequently, the school board in private (the architect was

absent) sessions defined its environmental problem and decided to build a new site as a solution. In accordance with their definition of the problem and solution, it purchased a gentle sloped piece of land (a five acre farmland) 17 miles from the periphery of the city. It also appointed a seven member building committee who drew up a brief for the new site.

#### THE ENVIRONMENTAL PROBLEMS OF Z HIGH SCHOOL

The environmental problems of Z High School have been caused by its large enrollment of 700 pupils which were all-day students. The problem was further complicated by 1) the fact that about 90% of its pupils were drawn from the residential zone in the city in which it is located, and 2) that it was bounded on three sides by densely built dwelling houses and on the fourth side by a railway yard which made horizontal expansion a problem.

Furthermore, about 70% of its student population would not be able to afford boarding fees if the school changed its site to a distant location which could mean providing boarding facilities.

Another problem was that the quality of its temporary buildings were below the standard specified by building codes for public buildings.

#### OPTIONS OPEN FOR SOLVING ITS ENVIRONMENTAL PROBLEM

With the ministry's environmental development program available, Z High School had the options to

- expand its buildings vertically and renovate them.
- expand the site by acquiring adjacent houses or plots.

- acquire vacant plots in the community and have dispersed the school buildings.
- build a new site outside the city boundary.

#### PROBLEMS OF BUILDING A NEW SITE OUTSIDE THE CITY

Of the four options available to the school, building a new site was more problematic -

- the high cost of putting up a new building.
- cost of transporting students who cannot afford boarding fees.
- problem of relocating students who cannot afford both boarding and daily bus ride fees.
- extra cost of transporting furniture and equipment from a temporary to a new site.
- extra cost of telephone cable, water, sewage, electricity due to distance from city.

#### ARCHITECT'S PROPOSAL

The consulting architect was unaware of his client's hidden goals which concentrated on solving the wrong problem (designing for the new site).

Consequently, the ministry's evaluation was precise and it communicated to both the school board and architect that 1) the design proposals were irrelevant to the schools environmental problems, and 2) it was terminating its contract with the architect.

#### THE SECOND PHASE AT Z HIGH SCHOOL PROJECT

After this initial disappointment, the school board made a decision to go ahead with a reversed and very modest design of the

new site, and to raise an additional sum of \$150,000 annually from its religious patrons.

As the changes in the cliental system were taking place, the firm of architects employed a new staff to reverse the design proposal.

From the three episodes that followed, it was apparent that the firm of architects did not learn from the episode with the ministry. The change of clientship would have signaled to them that some change of work practice was needed in order to be more responsive and sensitive to its clients problem. This did not happen. The new architect proceeded in much the same strategy model too in defining the design problem. He entered the problem situation completely accepting all the information he was presented with minimum of uncertainty and consequently did not identify all the elements of the problem. He strived very hard to solve the problems which later turned out to be wrong.

#### FIRST EPISODE

It turned out later that the school was unable to raise the additional \$150,000 annually. But it was on the basis of this additional sum that the reversed design was based. The reversed design would take 13 to 15 years to build without that additional sum.

Budget was not the only problem the architect had to face. The communities of both the temporary and new site demonstrated against the school board. Both communities had different reasons for demonstrating.

## SECOND EPISODE - THE NEW SITE COMMUNITY DEMONSTRATION

In order for the school to be reimbursed annually, the school had to show evidence of work on the new site. To meet this reimbursement requirement in the first year, the architect suggested that the school could excavate the site while the design was in its final stages. This advice sounds simple when viewed in isolation. But put in its proper context, it was a disaster: a slopey, excavated site in the rainy season of a tropical climate is a good food for soil erosion. The excavated site became a catalyst for the erosion of some adjacent farmlands. Consequently, the farmers demonstrated and demanded an adequate compensation for their destroyed crops.

## THIRD EPISODE - DEMONSTRATION OF TEMPORARY SITE COMMUNITY

The residents demonstrated against -

- the idea of the change of site because of the extra problem involved (see problems of building a new site outside the city).

At this point, the school board faced with all these protests terminated their contract with the architect.

This move by the school board was not surprising. The architects have been trained as designers - designers of artifact not as problem definers. To be effective, the architect has to be both a problem definer and problem designer. A rigorous diagnosis of the school's problem would have saved the architects and the clients the embarrassment they all experienced.

SCHOKBETON INDUSTRIALIZED HOUSING PROJECT IN GHANA

This case points out the problems associated with:

- 1) essentially using a ready made solution for the wrong problem.
- 2) the inability of the architects advising the government of Ghana to recognize a new problem from an old one.
- 3) the inability of the architects advising the government of Ghana to create and sustain the conditions for objective defining and evaluating a problem.
- 4) the inability of Schokbeton's architects to recognize their own interest and values from the facts of a problem situation.
- 5) the inability of Schokbeton's architects to collect information use the information to define the nature of the problem properly.

In 1952, the government of Ghana found that it had very serious housing problems. To solve them, she contracted Messr. N. V. Schokbeton

of Kampen to import its industrialized prefabrication system. The performance of the imported system in Ghana was below expectations. Five years later, the government invited U. N. technical assistance programs to evaluate the venture. The U. N. technical assistance program recommended that the venture be abandoned.

The U. N. technical assistance program report provided excerpts for the chronology of events which took place.

'After the second World War, the Governments of almost all the countries in the world found themselves faced with severe housing shortages. These were accompanied by a shortage of materials and skilled manpower. As the relief of the shortage by traditional methods of construction would have been a slow process, many governments took an interest in attempts to produce houses by industrial mass manufacturing methods, prefabrication.'

'The United States and a number of the principal European countries, as well as many tropical countries, have conducted experiments into all forms of prefabrication.'

'As the government of Ghana found itself in a position similar to most other countries, it decided in 1951 to investigate the possibility of relieving the housing shortage in the country and speeding up the development of its building industry by the introduction of non-traditional methods of construction, i.e., some form or other of prefabrication. For this purpose, negotiations were started with Messrs. N. V. Schokbeton of Kampen, Holland, who claimed to be an expert in prefabrication methods using a special type of precast concrete.'

'A part of about 30 members of the legislative assembly and officials headed by Mr. Flutter, then Director of Housing, paid a visit to the firm's works in Holland. Subsequently an agreement was reached on 18 April 1952, under which N. V. Schokbeton undertook to carry out a survey for the purpose of determining whether it is technically and economically practical to produce in the Gold Coast concrete building components of the type produced by the company at their factory in Kampen from raw materials found on the Gold Coast. This survey was also to include investigations necessary for:

- a) assessing the requirements for the next five years (and for the next five years thereafter) by the government and by the general public of buildings of a type for which Schokbeton components could be used in their construction;
- b) ascertaining whether there existed in sufficient proximity

to each other in the necessary quantity all the raw materials of sufficient quality required to produce Schokbeton components;

c) calculating the initial cost of factories with the capacity necessary to supply the potential demand for Schokbeton components year by year as assessed under paragraph a) above and advising upon the specification of the necessary factories;

d) ascertaining the most practical siting of factories for the production of Schokbeton components from such raw materials;

e) calculating the cost of production of Schokbeton components necessary for a standard house. (For the purpose of this agreement, 'standard house' means a house of the type for which there is assessed to be the greatest demand under the provisions of paragraph a) above of which the company will produce a specification).

f) calculating the transportation costs for a standard house along representative distribution lines from the factory sites which the company considered most practical; and

g) calculating the erection costs for the standard house.'

'While the survey was going on, two contracts were concluded between the government and the company on 8 February 1952 and 30 July 1953 under Messrs. Schokbeton undertook to build 168 sample houses at Accra, Kumasi and Takoradi.'

'The company thus acquired a double role: as authors of the Schokbeton report they consulted and trusted advisers of the government and as producers of the sample houses they became suppliers of the very commodity on the suitability of which they were to advise.'

The problem statement for the feasibility study falls short of a revealing one. It was directed only at finding 'whether' the solution would work (and maybe not even that). But the 'whether' was not specified in terms of 'for whom?', 'for what purpose?', 'in what context?'. The problem statement showed an ignorance of the importance of the question 'why' and of the need for investigating both positive and negative consequences of any solution as part of problem definition.

The two contracts the government of Ghana and Schokbeton signed while the feasibility study had not been accomplished did not help to rectify the error. It indicated a conflict of explicit problem defi-

nition management norm on the part of the architects advising the government to test and to confirm or disconfirm assumptions about the problem and problem solution. There was a strong commitment on the part of the government of Ghana to buy what Schokbeton had to sell and commitment on the part of Schokbeton to sell its products. The implication of this conflict was that it eroded away the condition (total uncertainty) for:

1) recognizing some critical elements of the problem and of the Schokbeton method as a solution,

2) making an objective decision on the part of the government and conduction of some proper identification and definition of the problem and finding a solution to it. The U. N. technical assistance program in retrospect commented that 'had there been an independent competent consultant advising on the.....product, the recommendation might have been different and an enormous expenditure avoided.'

In December 1952, the firm submitted its feasibility study containing 175 pages and an appendix comprising various plans and drawings, plus estimates of the cost of the equipment required for a Schokbeton factory.

'As neither the survey nor the sample houses have convinced the government of the Gold Coast of the advisability of building Schokbeton factories and as the Schokbeton houses have caused much controversy, the U. N. Technical Assistance Mission on Housing was asked in a letter dated 5 November 1954 from the Minister of Works to examine Messr.Schokbeton's survey report and the Schokbeton houses.'

The U. N. was harsh in its evaluation of the feasibility study report:

'This document falls short by a large margin of what the government had a right to expect.'

More specific criticism included:

'In the first place, more than half of the report is devoted to climatic, social and economic data of the country which are pulled from official sources. Another part consists of disquisitions on different building materials, local and imported.'

'Almost nothing, however, is said about the Schokbeton process itself. In fact, all technical information relating to this process (mechanical properties of concrete slabs, size of components, method of erection, etc.) had to be gathered by the Mission through direct inspection of the Schokbeton sample houses.'

'The survey report is silent about the methods of production of Schokbeton building components and the written descriptions of Schokbeton plants and equipment are hardly any help in this respect.'

'As the report sheds no light on the Schokbeton manufacturing and fabrication methods, it does not satisfy paragraph 2 of the agreement which specifically asks for a study of the economic and technical practicability of producing in the Gold Coast concrete building components of the type produced by the company at their factory in Kampen.'

'Many of the arguments of the report are irrelevant and in no way bear directly on any particular construction method, and Schokbeton's conclusions concerning the exceptional suitability of their process to the Ghana problem are entirely unconvincing. The same reasoning could be applied to many other building methods, including classical methods.'

'Neither does the total cost of 168 Schokbeton prototype houses, which amounted to approximately \$336,000 help to determine even roughly the price of future Schokbeton houses. On 8 February 1952, they agreed to build 134 houses for \$188,000. Eventually, 64 of the houses of this contract were completed at a cost of more than \$166,000. The firm's estimates of the cost of transport (within a radius of 40 miles) and erection as mentioned in the survey report are extremely optimistic.'

Due to the absence of relevant information, the entire argument of the suitability of Schokbeton's system as a solution to Ghana's problem stumbled on the cost comparison between Schokbeton's process and traditional methods of building in Ghana. The U.N. technical team could not carry out this comparison as the Schokbeton's report did not

provide cost analysis of Schokbeton's process - which was a requirement of the feasibility study - problems e) and g). As nothing else was available by which to carry out the cost comparison, the project was allowed to continue for another five years until the U. N. evaluation was completed.

SCHOKBETON REPORT ON FEASIBILITY PROBLEM - c)

The feasibility study recommended building a factory for producing 3,000 'room-units' annually in each of three major cities. Each city is the center of a supply region with a 40 miles radius. The capital investment for each factory was estimated to be about \$417,300 per factory and \$1,251,900 for three factories. The estimate of the capital to be invested in each factory for annual production of 3,000 room-units is calculated as shown below:

Industrial buildings and machinery	\$217,300
Initial costs and working capital	100,000
Housing of staff	50,000
Installation and equipment of a sand quarry	<u>50,000</u>
Total	<u>\$417,300</u>

The U. N. pointed out that:

1) 'these figures were deficient in that they failed to account for the purchase of transportation, mechanical handling equipment of the building site, and for land (given as 20 acres) upon which the plants and staff quarters were to be built.'

2) 'that should the government decide to build three Schokbeton factories as proposed, it would commit itself to an expenditure much larger than three times \$417,300. We are informed that the production capacity of three factories will amount to 9,000 room-units per annum. In their letter No. NFW/d.B824, dated 4 March 1953, the firm quotes the cost of a two-roomed house as \$600. The price of a one room-unit may be assumed to be somewhat less than half of this sum, say \$250. If this is correct, the value of the annual production of the three

factories would be in the region of 9,000 x \$250 or two and one-quarter million pounds.'

'As the price quoted for the Schokbeton panels is obviously based on the assumption of continuous full production, the government as owner of the factories and a quarter million pounds are produced and used every year. Moreover, as the price of the Schokbeton houses would be higher than that of other houses, direct sales of Schokbeton panels to the public would be unlikly. The government would have to take over the whole output for a programme of subsidized housing and thus commit itself to an annual expenditure of \$2,250,000 plus a considerable sum for the acquisition and development of land, roads, drains, services, etc. This recurring expenditure would be considerably larger than the amounts earmarked for the annual expenditure for housing in the present five-year plan. Yet the effect of this expenditure would be restricted to the three areas of Accra, Kumasi and Takoradi, i.e., to circles of forty miles radius around the propped three factories.'

Schokbeton manufacturer attempted to claim in its feasibility study report that the prefabricated 'components can be bought by private contractors for the erection of private houses.'

The U. N. challenged this assertion by stating that:

'as far as private buildings are concerned, it is difficult to understand why they should (unless forced by severe shortages of essential materials) make use of a building method which is more expensive than the traditional methods to which they are accustomed.'

On the face value of this report, the officials of Schokbeton prefabrication needed to question every assertion they made in order to improve the quality of this report. 'Why' questions would have made a difference in surfacing their invalid tacit assumptions. Perhaps they did and on purpose left out their findings as they had their own interest at heart.

The Schokbeton feasibility study report did not only poorly define the economic problem associated with the project, it also complete missed the essence of an industrialized method in design. Consequently, the U. N. criticism was sharp in the design of the houses. The

need for sensitive and high quality design, of course, is not only true for industrialized houses but for conventional units as well. The design of industrialized houses takes on some special significance in that the units are standardized and design features are proliferated over large volumes of output. Consequently, the U. N. criticism becomes more important than if the same defects were noted for conventional constructed houses. The U. N. evaluation report noted that the Schokbeton houses have no special or outstanding features. The evaluation report point out that the prefabricated slab components were

'...heavy and brittle, their manipulation, transport and storage enforces prohibitive waste, despite cost, weight and waste, the house will probably not afford the protection against moisture, rust, cracks, blisters and other disorders its cost should have assured. The bolted joints appear too frail for earthquakes, and other methods are superior. The house...is ill-adapted to the climatic condition of Ghana (there is, for example, no ventilation beneath the ceiling, the rooms are unnecessarily high, there is no ventilation in the lower parts of the walls, there is insufficient protection of facades against solar radiation, etc.)'

'These mistakes can of course be corrected by a more thorough study of the questions which are not peculiar to the Schokbeton system, they are simply due to the inability of the firm to use the climatic, geographical and social information collected by its staff for their own report.'

Although the U. N. technical assistance program pinned the blame on Schokbeton, their evaluation report, much of the blame should have been pinned on the government of Ghana. Maybe, those inabilities in problem definition shown by Schokbeton were done on purpose. They had a product to sell. Like salesmen, they had their own interest at heart and consequently were unable to distinguish their values from the facts of the problem situation.

It was the government of Ghana that should have assured that the problem was well-defined. They should have began by getting a disinterested party (a party who would not be supplying the housing to define the problem). 'They essentially hired the lion to look after the welfare of the cattle.'

#### LESSONS FROM THESE CASES

The lessons learned from these cases are:

It was at this point that I felt that certain practices of the architect have tended to make architects design for the wrong problems.

- that problems are situational and that architects needed to define problems better.

These observations motivated me to interview some architects to see if they have had similar experiences.

## CHAPTER THREE

### INTRODUCTION

In this chapter, the data obtained from the interviews with the four architects who practice and teach design and three other architects who practice architecture were analyzed specifically to provide hypothetical answers to the questions below. These questions are important because they could provide the basis for reform of architectural curriculum and pedagogy.

### QUESTIONS

a) Do you teach techniques of problem definition (i) in abstract or (ii) do you teach it by applying techniques to real or simulated problems (iii) or both? (iv) by imitating or (v) all of the above.

b) who is to define the problem, design the problem definition process for the design studio - the instructor or the student or both? There is something to be said for the instructor doing it very well and thereby producing a model that others (students) may follow. It will ensure that the student does not dissipate his energy in

- 1) learning poor techniques
- 2) reacumulating information and thus spending his time learning only worthwhile technique.

But will they follow his model (his approach in defining the problem)? The model is something that has been handed to them.

Thsu a question arises - are they really into it? i.e., can they identify with someone else's problem definition? This further raises

a basic question in learning theory - Will the student learn better by following a carefully thought out model or by having to work out the problem definition himself?

#### ANALYSIS OF SENSE OF ACCOMPLISHMENT

Sense of accomplishment is an emotional reaction that arises when the architect has achieved a desired goal and he is aware that he has achieved it. These goals range from creative solutions for problems to good working relationships with clients. For example, Respondent A explained it:

(i) "Part of the accomplishment I felt was when the college (client) was able to think along with me and think together. That was my kind of accomplishment. The other kind of accomplishment is when I just felt that I have completely explored all solutions in my mind and have written it down, drawn it and it seemed to be satisfactory." When further questioned why did you feel a sense of accomplishment, this was his reaction -

(ii) "the sense of accomplishment I felt here was - I had been able to conceive in my mind an idea - that was an expanded idea, it was not a traditional idea. It was a sense of a vision or visionary or an idea which has a vision about it. It was a creative moment."

Respondent

"There is always a sense of accomplishment when you realize that you and the client are in agreement at a certain issue. When you realise that you are working together and not against each other. When you

realize that the relationship is a natural one."

From the above definition and examples expressed by respondents, a sense of accomplishment can be inferred to come only

- when the goals/evaluation criteria of a problem
- when the objectives of a problem definition process stage
- or when the objectives of a cycle of iteration have been well defined as to tell the architect when he has got a good idea.

Therefore, the fact that some architects feel a sense of accomplishment only after the completion of the project could mean:

(a) that the objectives of the different stages/cycles of iteration have not been well defined for models one and two methods of practice. But, for a model three architect, it is a good guide that the problem has been well defined. This is the case because model three architects are expected to define the problem well only after the P.d. process has been completed. (See model three)

(b) that the sense of accomplishment surfaced is comparable to the pleasure expressed at the sight of concrete experience - of seeing a building completed.

Since the goal of problem definition is to understand the nature of a problem and the goal of understanding the nature of a problem is to enhance the definition of problem evaluation criteria/goals, and since it is only when the evaluation criteria have been so well defined that the architect can know when he has got a good solution idea and so have a sense of accomplishment, we can hypothetically conclude that:

- the presence of sense of accomplishment is a good indicator and guide that the problem has been well defined.

- that the level of sense of accomplishment is a good indicator and guide for knowing how well the problem has been defined.

However respondents pointed out that some projects take long periods to get built, or long periods between the episodes of problem definition where nothing happens. Consequently the architect often loses that sense of accomplishment and the reinforcement that would normally have followed it. He also pointed out that this is where the cyclic problem definition process would be of use. One possible way he suggested that architects could overcome this was to identify some early actions, if when taken will put some concrete stuff on the ground that the architect can see.

In this sense, the loss of sense of accomplishment due to long passive periods between episodes could also be taken hypothetically as an indicator of ineffective problem definition process.

#### ANALYSIS OF SENSE OF FRUSTRATION

Sense of frustration is an emotional reaction that arises when the architect encounters certain kinds of blocks on the path to his desired professional goal. Some of these blocks range from technical informations to private assumptions held by the architect.

For example, the following interviewed respondents have this to say about the experiences:

There was --- frustration with not getting the survey map of the site when we needed it most, we wanted to have the construction started immediately when the snow left the ground. We had a great tight schedule because of the many things we had to do. The survey was holding back a lot of things we wanted to do. --- --- to overcome

the frustration... we made a crude survey of our own. That led to a new frustration as we thought it was wrong."

Respondent:

(One frustration) was with the area of location of the facility. While their (client) image of it was of remote and isolated place, I felt there was a conflict of location. I felt that for the need they were talking about, that the location they were talking about was not in their best interest. And again they were reluctant to consider my suggestions on that."

Respondent E:

"Of course, one is always frustrated by the price, everyone wants a little more than he can actually afford. It's not every one who likes a limited money with which to build. At least I don't. There is a problem in that the client always wants more than he can afford to pay for. I had to make certain major decisions before certain parts of the program could be left out because he could not afford to pay for everything he wanted."

"I had some frustrations very early because of the dominant relationship the client had with his wife. I was worried in part - I thought perhaps the marriage was not stable. It turned out, it was a very stable marriage but at the time it appeared to me that it might not be. This is something that happens frequently with families who are building houses. They seem to try to build to stabilize their marriage. I was afraid that this was one of those cases. And I was worried for a while.

I also was frustrated because I could not get enough information from her. Each time I asked her for information, he would give me the information. So I felt she did not have a large enough role. It turned out to be an equally good house for her and for him."

From the above one can infer that the sense of frustration is a symptomatic feeling of a state of a situation which comprises two opposing forces:

- 1) A set of pressures to non sequester a sense of accomplishment
- 2) A set of forces (blocks) restraining the architect from the achievement of this sense of accomplishment

A force field analysis diagram can be used to represent this situation.

(See Diagram)

Although these blocks architects experience during frustration are specific forces and numerous in number, they tend to fall into one of the three categories:

- 1) Self - those blocks that are due to the architect's attitudes behavior and practices.
- 2) Others - those blocks that are due to the clients' and users/contractors/ etc. attitudes behavior and practices.
- 3) Environment - those blocks that are a result of a nonpersonal nature.

One can infer hypothetically from a comparison of all the respondents that these forces become blocks and problematic to the architect only when the architect does not have

COMPARISON OF PROBLEM DEFINITION PROCESSES OF ALL RESPONDENTS

	Problem Setting	P. D. Process	Sense of Accomplishment	Sense of Frustration
Respondent A (Practicing Architect)	Complex: Clients are multiple Clients are part of the User system.	Emphasized Design as an artifact P.d. Process is linear and Model One advocated an idea. Minimum uncertainty valued.	Felt sense of accomplishment when he had convinced his client about the remit of his idea. Felt a sense of it when he realized that it was a good vision.	Was frustrated at the beginning to the design concept stage. Was frustrated in locating the building. All frustrations were due to conflicts with Client.
Respondent B (Teacher or L Practicing Architect)	Problem setting was simplistic. The client was also the user. The problem was defined by the client.	Emphasized design as artifact. P.d. process was linear. Design process was participatory. Accepted situation with minimum uncertainty.	When he and the client were in agreement on certain issues. When crude survey turned out accurate. After construction was completed.	Major frustrations were felt in construction stages. Felt frustrated due to lack of information from wife of client or from surveyor.
Respondent C (Teacher and Practicing Architect)	Complex: Had multiple clients. The intermediate client was part of the users. The main client was not necessarily the user.	Emphasized design as both artifact of process. His process was participatory. P.d. was linear valued minimum uncertainty.	Felt sense of accomplishment when he had actually involved his intermediate clerks-community.	He felt frustrated only when he was dealing with Mr. Bureaucrat clients. He felt frustrated when clients were talking about process and not about building.
Respondent D (Teacher and Practicing Architect)	The problem setting was simplistic but could be complex. The clients were not the users.	Emphasized design as artifact. Problem definition is cyclical. Advocated an idea valuing total uncertainty.	The sense of accomplishment came at the end of each cycle of iteration.	Whole process was frustrating but valued.

Respondent E (Teacher and Practicing Architect)	The problem setting was complex. Clients were part of the user system.	Emphasized design as a process. The P.d. process was cyclical and valued total uncertainty.	Minor senses of accomplishment came only at the end of each iteration.	The whole process was frustrating but valued.
Respondent F	The problem setting was simplistic. His client was part of the users.	Emphasized design as an artifact. His process was linear (model one).	Did not feel a sense of accomplishment.	Did not feel sense of frustration.
Respondent G	The problem setting was complex. His clients were not necessarily the users.	P.d. is linear and P.S. is cyclical - model two architect. Emphasized both product and process. He worked with a group of architects who emphasized design as an artifact.	Sense of accomplishment came when an analogy was developed in problem solving stage.	Felt frustrated at every stage of problem definition.

- adequate knowledge and understanding of the design goal
- clear understanding of both the negative and positive consequences of each or all the design choices available to him.
- adequate knowledge of the first practical steps for achieving the desired design.

For example

- 1) That while uncertainty and dilemma are frustrations to respondent B, respondents E and D welcome it as a goal for their problem definition stage of design.
- 2) While respondent A looks at conflicts and problems and gets frustrated over it, respondent E and D welcome it as a moment for creativity.
- 3) While insufficient information is regarded by respondent B as problematic and so frustrating, respondent E and D assume it is the very essence of problem definition.
- (4) This inference can further be argued for by the strategies architects employ to overcome frustrations: (i) by collecting more information about the problem setting (ii) by standing aside and reflecting on the problem (iii) by taking action which will produce a feedback.

For example:

Respondent E suggested the following strategies "You continue to lay the frustration on the table and not let them sit aside. You get the people together and let them know what you are frustrated about. That is to let your notions be felt. In some cases you let

things ride for a while or cool off for a while. Sometime you use hard work and find a way around something."

Another respondent elaborated on these strategies (i) by doing it - "we overcame the frustration at the survey by making a crude survey of our own." - How - "That led to a new frustration when we thought it was wrong. But we did go ahead with it and it turned out to be right later."

Confrontation - "With the cost situation: it was a very bad problem with the client. It is only a matter of being very open with the client about what the cost problems were and not letting him disregard the cost problems at every stage and understand where he is and not let him say we will worry about it later now. That is what I did and it worked out reasonably well.

With the wife, it was simply a matter that I kept asking her questions as much as I could. After a time a better working situation developed although it was not good. After several meetings I thought I have got enough information from her. I also made a particular point of listening to her comments which she offered. She had her set of frustrations about the design. I made a special note at what she said and asked. I made sure I solved those things before visiting them again."

Since, uncertainty, dilemma, conflicts and insufficient information generate a sense of frustration and so impede the progression toward the goal only when the architect does not have sufficient understanding of the problem goal/nature, therefore, the presence of a sense of

frustration can be inferred hypothetically to indicate a lack of adequate understanding of the problem's nature. (see force field diagram)

Since the objective of the problem definition process is to explicitly understand the nature of the problem, we can therefore hypothetically conclude that :

- the presence of a sense of frustration in a problem definition process is an indicator that something is wrong somewhere.

- that what makes a difference to the way a problem definition processes are the architect's attitude, behavior and practices to uncertainty and conflicts.

One way to make connection between all the client's senses of frustration/accomplishment is to regard the former as a product of forces working in opposite directions. While in actual situations the forces at work operate from many different directions, at different strengths, and with varying degrees of interrelationships, one can simplify it by thinking about the elements as forces operating in opposite directions: those forces operating to give the architect more understanding of the problem nature (we shall call driving forces) and those operating to restrain/block the architect from his goals (we shall call restraining forces). One can assume that for any given situation, it is analogous to a body at rest and therefore hypothetically has a total sum of zero forces and the situation will change in the direction of the unbalancing force.

In any given situation of a sense of frustration or problem deter-

mination, we have the following restraining forces: uncertainty, dilemma, conflicts, insufficient information. The driving forces are energy to acquire knowledge about "For whom?" "For what" "How?" , positive and negative consequences and to achieve minimum cost of problem definition.

One method of overcoming a sense of frustration is to increase the pressure on the driving forces. The predictable effect of increasing this pressure is to have tension analogous to the tension of a spring when pressure is applied to it.

An alternative method is to eliminate/reduce those elements causing blocks. In this way, the level will rise to a new higher point without the tension. See diagram.

KEY

- (8) Uncertainty
- (9) Dilemma
- (10) Conflicts
- (11) Insufficient Information

HIGH LEVEL OF UNDERSTANDING OF PROBLEM NATURE

HIGH

(sense of accomplishment)

LOW

LOW

(sense of frustration)

HIGH

RESTRAINING FORCES

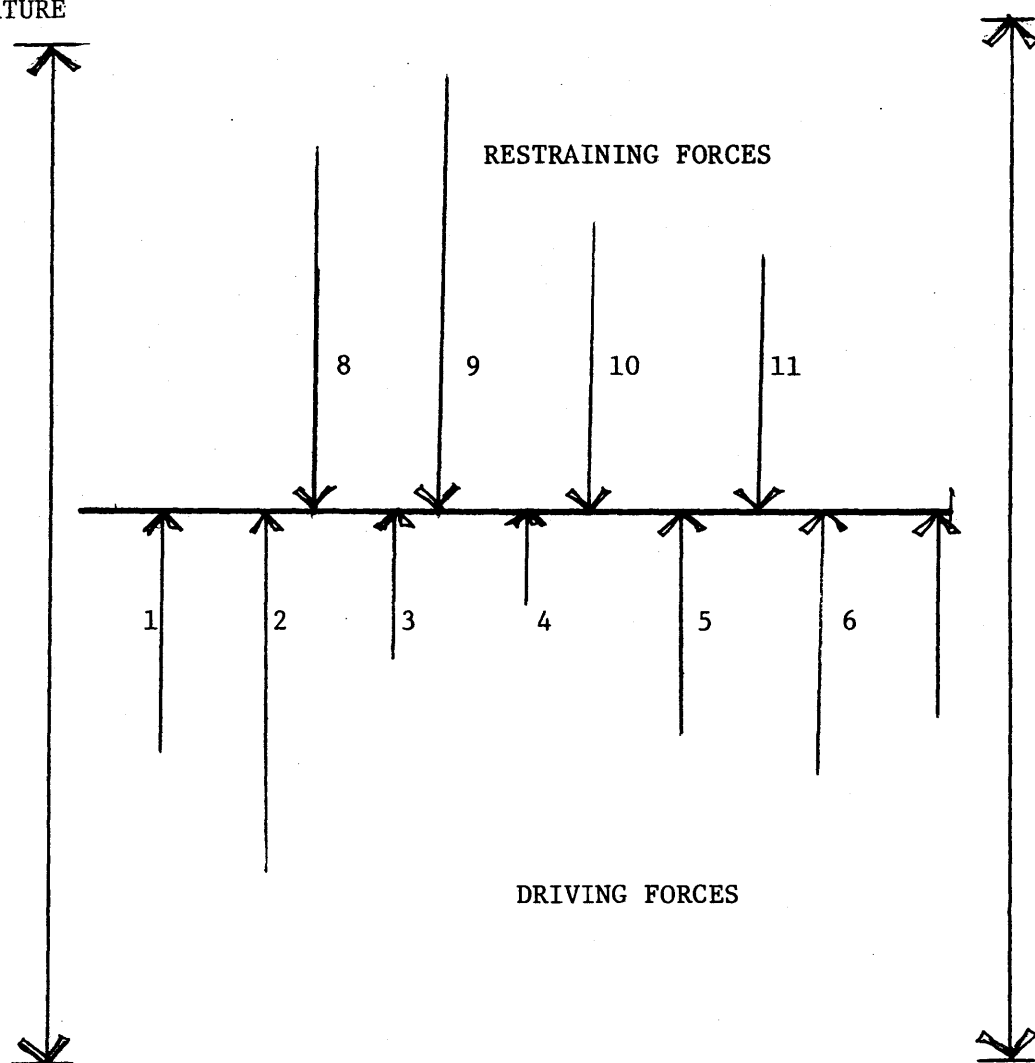
DRIVING FORCES

KEY

Energy towards acquiring more knowledge/understanding of:

- (1) 'For whom'
- (2) 'For what'
- (3) 'How'
- (4) 'In what context'
- (5) Positive consequence
- (6) Negative consequence
- (7) Reduction of cost of problem definition

LOW LEVEL OF UNDERSTANDING OF PROBLEM NATURE



A FORCE FIELD DIAGRAM

HOW YOU KNOW ONE WHEN

YOU SEE ONE

(A GOOD PROBLEM DEFINITION PROCESS)

### TEACHING PROBLEM DEFINITION

Elements carrying frustration have been identified to come from three (3) sources.

- self - things that have to do with one as an individual
- others - things that have to do with other people, clients, users, contractors, etc.
- environment - things of a non-personal nature, e.g., budget, site, building codes.

Therefore to eliminate frustration in some situations is to eliminate the self elements causing it. It is not surprising that the respondents hesitated to identify that their attitudes, behaviors, and practices could have been part of the problem.

Therefore, to teach problem definition is to teach how:

- to diagnose self
- to diagnose others
- to diagnose environment

and also to teach certain attitudes, behaviors, practices which eliminate and reduce those element causing blocks.

Leavitt says that people --- learn their personalities: they learn many of their social and egotistic needs, their attitudes and their habitual ways of behaving.--- They are learning whenever their behavior at times is modified as a consequence of the experience at time 1"

Ben Snyder further argues that learning takes place only when a change in behavior has been accompanied by changes in assumptions.

Richard Beckhard provides further insight into the conditions for which change can take place and stay maintained. These conditions modified for teaching change of behavior will read as follows:

(i) the student must have a real dissatisfaction with their previous problem definition attitudes, behavior and practices.

(ii) the student must have a clear picture of his desired ideal attitudes, behavior and practices that will enable him to be effective.

(iii) the student must have knowledge of the practical first step towards these desired ideal attitudes, behavior and practices.

Implications for the question:

Therefore, to teach the desired ideal attitudes, behaviors and practices to students effectively

- that the students should first be put through a real and simulated problem situation where they generate behavioral data and through examining them have increased dissatisfaction with their previous problem definition attitudes, behavior and practices. This should be continued to the point when their level of dissatisfaction is very high.

- that at the point when their level of dissatisfaction has reached a high point they then should be presented abstractly with the desired ideal problem definition attitudes, behavior and practices and also by imitating how it is used.

- at this point in time they should be encouraged (1) to apply and test out the carefully prepared model and (2) to internalize and personalize the model.

- that the students should help the faculty design their problem in the early stages of learning but should later be encouraged to design their simulated problems. The argument for this is that a good designer of problems is also a good definer of problems. This is analogous to a good evaluator of defined problems is also a good definer of problems.

-that the student needs an environment different from the traditional design studio. He needs a laboratory or workshop where he can be presented with information, imitate carefully thought out models and generate behavioral data which are fed back to him continuously. It would be necessary that the teacher do this feedback in the early stages of intervention. It should later be discontinued and the student presented with tools with which to collect his own behavioral data and analyze them himself = a direction towards a self-directed learner. This will encourage learning outside the formal classroom.

Therefore, what I am saying/or my hypotheses are:

- that the presence/absence of a sense of accomplishment/frustration is a good guide for knowing when the architect has defined the problem well.

- that the level of sense of accomplishment/frustration is a good guide for knowing how well the architect has defined the problem.

- that the architect's attitudes, behaviors and practices towards uncertainty makes a difference towards whether, when and how he feels the sense of accomplishment/frustration.

- that these attitudes, behaviors and practices can be taught.

- that the student will learn best in an environment (curriculum and pedagogy) which combines presentation of information abstractly

- imitation of a carefully thought out model and which

- encourages student to apply and test which allows the student to internalize and personalize the carefully thought out model.

- which encourages its students to design their own problem.

These hypotheses have their implications. These implications are considered in detail in Part Two. Some of these desired ideal attitudes, behaviors and practices are listed in Chapter Four.

PART TWO

CHAPTER FOUR

The distinct question around defining the change problem in architectural education reform is -- what types of change

- in attitude
- in behavior
- practices and ways of work
- knowledge and understanding

are desired to make the architect a good problem definer?

CHANGE OF ATTITUDES, BEHAVIOR & WORK PRACTICES DESIRED ARE:

(1) Architects need to define/solve problem through cycles of iteration:

A near full understanding of a problem nature comes out only after the problem has been solved. Consequently, when a problem is near well defined, the architect is more than half way to solving the problem. A combined problem defining - problem solving process maximizes this phenomenon. It also helps to eliminate the feeling of frustration due to mental blocks, self-confirming loops.

(2) Architect needs to design problem evaluation criteria to be clear enough so as to tell him when he has got a good idea:

Problem defining - solving process is a cycle of iterations of activities treating the problem through several cycles and emphasizing different parts of the problem in each cycle. It is potentially an endless process. The process, however, must be terminated at a point

in time. The point when one terminates the process is important to the level of understanding of the problem nature and consequently to solving the problem.

An evaluation criterion that is clear enough to tell one when one has got a good idea is critical to remedy the seemingly endless problem definition process.

A clearly stated evaluation criterion has another advantage. It is a step well in advance of defining and solving the problem. It also helps to exclude noise from the process and hence maximizes valid information.

(3) The architect needs to redesign his problem evaluation criteria at the end of each cycle of iteration:

To redefine evaluation criteria acts as a safeguard against using old criteria for new problem context. Using old criteria to evaluate new problem solution inhibits progress, causes frustration, distorts understanding and leads to negative learning.

(4) The architect needs to assume total uncertainty during his problem definition stage and his goal should be to reduce it to a minimum in problem solving stage in design:

Complete uncertainty should be assumed all through the problem definition. However the goal should be to reduce uncertainty at the completion of problem definition process. Consequently solution should be regarded as tentative. This is necessary to avoid getting locked up in self-confirming loops based on premature judgments. Assuming complete uncertainty is especially important if case histories/ prece-

dence are used to define and solve the problem. Assuming complete uncertainty facilitates the unfreezing of the architect, enhances the architect's ability to identify new problems from old ones.

(5) Architects must begin to ask questions which inquire into

- nature of phenomena:
- ethics of phenomena:

Problem definition problem-solving process involves continuous cycle of iteration of synthesis - action and evaluation. Each of these episodes is helped by identification and analysis of the factors which govern them.

In synthesis and evaluation we think of problems in terms of two major concerns:

- 1) validity of goals, philosophy and assumptions
- 2) consistency of execution of the relationships goals - philosophy - assumption - physical form.

Appraising issues of validity of goals, philosophy, and assumption proceed from product to goals. In the episode we are rating them in accordance with some standard of values. Questions asked in appraising these issues are for example, 'what makes this goal just/wrong?' 'What is right philosophy?' 'Are some pieces of architecture better than others?' 'What is valid?' - normative questions.

Appraising consistency of execution of goals, philosophy and assumption of a project prior to construction (i.e., during problem definition) is based on past experience of cause - effect relationships between the projected physical form and the expected consequences.

Consequently, the type of question asked must be cause-effect in its nature and need to be very specific. Some questions are more general than others. One question is more general than another, if it is about a broader class of things. e.g., about that five-story, five-foot glass module house rather than glass houses.

Questions asked for the purposes of synthesizing information in problem definition are questions dealing with the 'nature', method of knowing and not to what reality is like or what is valuable, but to our knowledge of reality or value. Examples of questions we ask are 'what makes one proposition follow logically from another?' 'How do you know when you see one?' - epistemological questions.

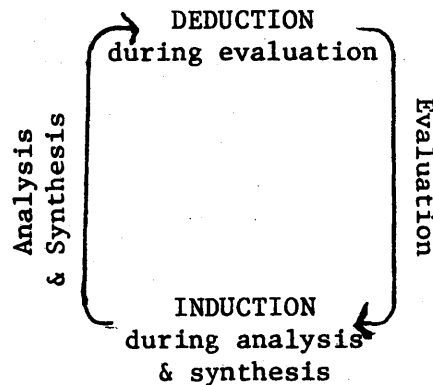
It is also necessary to follow each question you asked (whether cause - effect, normative or epistemological) by another category of questions - semiotic. Such question use words like 'meaning', 'reference', 'definition', 'emotive' and 'sign'. If done well it helps clarify meaning of vocabulary and so facilitates understanding of the problem.

(6) The type of reasoning the architect executes must be consistent with the desired attitudes, behavior and practices for every stage of design:

The evaluation episode of the cycles of iteration of problem defining - solving - evaluating process employs deduction as evaluation prior to construction is based on past experiences of cause - effect of a projected physical form.

But in order to assume complete uncertainty in problem definition,

a deductive reasoning is inconsistent and completely contradictory to that objective. It requires therefore that this inherent contradiction be deemphasized by induction in the analysis and synthesis episodes of problem definition. Thus we shall have cycles of iterations of induction - deduction.



Whenever intuition has been used, it is necessary that it should be based on solid knowledge of that subject matter and be followed by a deductive method to test and confirm/disconfirm assumptions made.

(7) Architects need to collect information directly from their sources:

There are two categories of information which architects need to collect about a problem context viz

- 1) Information about goals, philosophy and assumptions of the client, users (if the client and users are different people) and of the architect himself. These can best be collected from the images they have of themselves and of their environment. It is through these images one can find their hopes and aspirations.

It is also necessary that man be assumed as a complex being which he is. Simplified and generalized conceptions of man have a tendency to be self-confirming. Man is more complex than rational, economic, social or self-actualizing man. "Not only is he more complex within himself, being possessed of many needs and potentials, but he is also likely to differ from his neighbor in the patterns of his own complexity. It has always been difficult to generalize about man, and organizations within society are themselves becoming more complex and differentiated." - Schein - 1970. The implication to problem definition is that information about clients, users and of the architect himself must be very specific and free of generalization and must be obtained by direct means.

2) Information about the site, budget and operational objectives. They constitute the specification of the problem context. These are information that must be obtained (as brief) before the commencement of problem definition process.

(8) The architect should persistently question himself, others (clients and users):

Questioning does not only elicit the direct reason for a point of view but also underlying assumptions of which the believer may have been quite unaware until pressed. The underlying assumptions of a viewpoint are not, in a strict sense the reason for it, but they are part of the logical justification, since they have to be true for the reasons to count. One of the remarkable things of questioning is the way it brings to light hidden or half-hidden assumptions.

(9) The metaphors and analogies used by the architect in communication with his clients and users of his facilities must be compatible with situation:

Communication involves transferring a meaning from the sender's mind through a medium to the mind of the receiver. The meaning must pass through the mind of the senders background and formed by his ability as well as pass through the background and ability differences between the sender and the receiver. When appropriate metaphors and analogies are used, they facilitate understanding of the meaning. For the metaphor/analogy to be appropriate, it must be

- 1) compatible to the situation.
- 2) stimulate all the critical parts of the meaning and hold them securely.
- 3) enhance and not distract from the message.
- 4) be intimate enough to allow the message to be personal.
- 5) its symbolic characteristics must enhance and not distract from the message.
- 6) it must be familiar to the receiver.

(10) The metaphors and analogies the architect uses in problem solving must have a high degree of strangeness to himself:

In problem-solving processes, the designer is always communicating with himself and making connections. Synectics research revealed that the most important element in innovative problem-solving is viewing a familiar problem in strange new contexts. Interdependent with the innovation process is the learning process where one gains an under-

standing of a new problem or a new idea by viewing a strange problem in a familiar context.

Dr. Robert Stevenson, Chief Psychologist of the China Lake Naval Test Station research showed that the strangeness of the direct final analogy 'is directly connected to the innovation quotient of the practical viewpoint.

(11) Architects must begin to categorize information genotypically.

Information gathered during problem definition and solving is complex and is constantly changing. To hold many raw bits of this information in our memories efficiently is often useless as a great portion of it gets lost. 'It is as though we have only a limited number of file folders to work with but could label them any way we chose. If we insist on putting just one piece of information in one folder we soon run out of space. But if we find useful ways of grouping information, the same set of folders can hold an almost limitless quantity of information.'

The architect who classifies each bit of information for his problem definition operation separately, a phenotypical approach, will soon be overwhelmed by detail and will be unable to retrieve them when he needs them. To retrieve and transfer information from one project to another is like -- 'sticking a hand in and pulling something out of "knowledge" grab-bag....'

A genotypical approach does provide a basis for systematic ordering of information.

Categorizing systems, once set up, are difficult to break down and could lead to loss of some information. Consequently, if information is not progressively recategorized, some information will be permanently shut off.

TYPES OF KNOWLEDGE THE ARCHITECT MUST ACQUIRE IN ORDER TO BE A GOOD PROBLEM DEFINER:

Architects are likely to have dilemmas in defining problems. The dilemmas architects experience in their practice are for example:

a) The design of a new building is likely to be some threat to existing traditions, ways of work and relationships. Thus the need for a new building may mean that some degree of well-established forms, norms, ways of doing things must be replaced. It is also likely that some people may have to be displaced or replaced as it happens in new housing schemes. If a very efficient communication system is designed, it may mean reducing the number of liaison personnel. The clients who may know the implication of the architect's innovation is also threatened. If the threat of the architect's solution to the existing tradition is great, the architect might run into some problems. He is here faced with the dilemma of how far he can champion or advocate new ideas or change old ways. Is he to play only the role of a process consultant to the client's ideas? To what extent does he help the client face up to his concern for existing traditions which are under threat? An example is the case of the Z high school case. The authorities of this school may have known the problems involved in moving to a new site but were unwilling to face up to them. The

architect did not help them fact their problems but rather complied with their wishes by designing a new site for them.

b) When a client consults an architect, it is because he needs an expert's help in solving his problem. Consequently, an initial dependency results. Dependency is comfortable only when the client or the user do not have and do not want the expertise of the architect.

However, this is not always the case in architectural practice. Complex projects for clients have architects and other consultants in architecture and related professions on their staff. (e.g., government sponsored projects). The inside advisers need to be seen as competent consultants. But ironically they become dependent on one hand and resent their need for guidance on the other hand - an ambivalence. For the outside consultants this ambivalence often takes the form of over dependence by getting the consulting architect to make all decisions. This role tends towards an advocate of ideas. The consultants in the cliental system often become dependent so that if something goes wrong, the client knows who to blame. With an architect inside the client's system and solving a problem for the client, the dependency of his colleagues often proves that you are more competent than I am about this problem.'

The awareness of this dangerous dependency of win/lose generates frustration especially for the consulting architect who sees himself as a process consultant. This situation produces a real dilemma for such an architect. Thus, he is either to prove to his client and

advisers that he does have the skill to generate ideas and advocate them or to induce some client anxiety by not immediately behaving in (1)'s option. He could instead tease out the client's own ideas.

c) In a project where the architect has more than one client with conflicting goals and priorities, the architect is faced with the dilemma of where to put his own emphasis. How then should the architect be trained to handle such divert conflicts?

d) Architectural education reform must also train the architect to handle the pressure of the client for his immediate success which are superficial and have hidden cost. Here, the architect should be careful not to impose his values and ideas on his clients but try and make his clients see the superficiality of the immediate success and its hidden cost.

Therefore it would seem that the architect would need to bring the following knowledge to his problem definition process:

- knowledge of system diagnosis.  
of motivation theory.  
of situation analysis.  
of change strategies.
- handling resistance to change.
- understanding of cultural norms and values.

These would be the kind and nature of subjects which could be added to architectural curriculum. If added, it would result in a kind of marriage between organizational change and development content and the technical content in architectural education.

## CHAPTER FIVE

### CHANGES IN EDUCATIONAL OBJECTIVES DESIRED

There are three main strategies for designing educational objectives in architecture. Individually the three are evidently inadequate strategies to accommodate the desired attitude, behavior, practices, knowledge and understanding. Those strategies are:

1) Those defined in terms of professional spontaneity and emphasizing mental health. The objectives thus designed are comparable to Kohlberg's Romanticism.

2) Those defined in terms of a body of information and rules or values and emphasizing competence in their use. The objectives designed in these terms are comparable to the educational ideologies put forward by Kohlberg - 'cultural transmission'.

3) Those defined in terms of human development. Objectives designed in these terms are comparable to the educational ideologies named by Kohlberg as 'progressivism'.

### OBJECTIVES DEFINED IN TERMS OF PROFESSIONAL SPONTANEITY AND MENTAL HEALTH

The objectives hold that what comes from within the architect, or the student is more valued and thus the valid aspect of his development. Therefore architectural education should be permissive enough to allow the inner spontaneous abilities of the student to unfold. Consequently, teachers who hold these viewpoints argue that teaching students the ideas and attitudes of other 'great' architects results in meaningless learning and the suppression of inner spontaneous

abilities. They also (in Lawrence Kohlberg's terms) 'stress the biological metaphor of health and growth' in equating optimal mental development with mental health.

#### OBJECTIVES DEFINED IN TERMS OF A BODY OF INFORMATION AND RULES

These objectives form the foundation of 'traditional' school of architecture and traditional architectural courses. These schools and teachers believe that their primary task is the transmission of some technical bodies of information, rules and values to their students.

These objectives are the foundation of the architect-apprentice method of education. This approach assumes that (1) this technical information is located in the culture of the profession, and (2) that they are learned by imitation of experienced professionals or by instruction. Schools which adopt this objective evaluate their students successes in terms of competence - ability to incorporate the responses they were taught and to respond favorably to the demand of the system.

#### OBJECTIVES DEFINED IN TERMS OF HUMAN DEVELOPMENT

These objectives hold that 'education should nourish the student's interaction with his developing society and environment. Unlike educational objectives defined in terms of professional spontaneity, it does not assume that development is the unfolding of an innate pattern ...'instead they define development as a progression through invariant ordered sequential stages. The educational goal is the eventual attainment of a higher level or stage of development...'

#### STUDIO AND NON STUDIO COURSES TAUGHT

With this ideology of education, there is need for a supportive

environment that actively stimulates cognitive development through the assignment of students to tackle resolvable, genuine problems and simulated problems. Although both the apprentice and the human development educational ideologies emphasize acquisition of knowledge, only the latter sees it as an active change in patterns of thinking brought about by experiential problem-solving and learning situations.

#### EDUCATIONAL OBJECTIVES FOR TEACHING PROBLEM DEFINITION

Beyond the goal of teaching architecture students to understand the dynamics of problem definition, the three educational ideologies described above stress different aspects of knowledge, teaching and learning. Consequently, it would be illogical to choose one of these ideologies to the exclusion of the other two. Similarly, it would also be illogical to emphasize in equal terms all three educational ideologies in the design of problem definition educational objectives. The logical goal is to focus on the most relevant educational ideology while also incorporating only the necessary characteristics of the others.

The human development educational ideology is more relevant to the theory of problem defining and solving process. Therefore it is logical to focus the design of the educational objectives for teaching problem definition on its highest values. Its highest level of value in development is for the student to be a self-directed learner. To be a self-directed learner the student must be self-reliant in

- knowing when a problem has been well-defined.
- knowing where he is at in a problem definition process

at any point in time.

- knowing the appropriate questions to ask.
- knowing what types of information to collect.
- knowing where to collect this information.
- knowing how to manage a problem definition process.

The skills of defining a problem well do not automatically make the architect a self-directed learner. Thus he needs more skills to make him a self-directed learner.

David Kolb's experiential learning model throws some light on the abilities the architect needs to have to be a self-directed learner.

These are:

- 1) concrete experience abilities.
- 2) reflective observation abilities.
- 3) abstract conceptualization abilities.
- 4) active experimentation abilities.

Skills (1) are to abilities, (2) as a process consultant is to his client.

- That is, he must be able to involve himself fully, openly and without bias in new experiences (3,4)
- He must be able to reflect on and observe these experiences from many perspectives.
- He must be able to create concepts that integrate his observation into logically sound theories.
- He must be able to use these theories to make decisions and solve problems.

## PEDAGOGY

From the previous chapters, two critical issues have been surfaced which pedagogy must find ways of handling effectively. They are:

- 1) Training students to be self-directed learners. This makes growth the objective of architectural education.
- 2) The marriage between organizational change and development content and technical content of architectural education.

Two other issues which have not been surfaced but which are of equal importance are:

- 1) The learning styles of individual students.
- 2) The relationship between the supportive environment for learning and the student's learning style.

The task of pedagogical reform is therefore:

(1) To consider the theory of designing teaching environments (E) for individual students (P) to accomplish their educational objectives (B).  $B = P:E'$  (Kurt Lewin)

(2) To consider the theory of designing and teaching methods for the marriage of organizational change and development content and technical content of architecture. This strategy rests on the assumption that (i) a change in behavior results from the interaction between person (P) and environment (E), and that (ii) a differential and interactive approach to designing pedagogy has the advantage of viewing pedagogical reform in a way that directs an educational environment/ approach (E) toward the student's style of learning (P) to produce

desired effects (B).

#### THE ENVIRONMENT OF THE CLASSROOM

The educational environment comprises (a) the methods of intervention and (b) the supportive environment, and (c) some assumptions about individual change held by the faculty and student.

#### METHODS OF INTERVENTION

With acknowledgment to Monton and Blake, known types of intervention employed are Catharsis, Catalysis, Confrontation, Prescription, and Principles, Models or Theories.

#### CATHARTIC INTERVENTION

Cathartic intervention helps the student sort out emotions in order to get a more objective view of the problem situation or of himself or of both. Defining a design problem objectively can be made more difficult for a student when his/her emotions color the problem situation. 'Frustrations, anger, anxiety, even vague feelings that something is wrong can blacken the kind of thinking necessary for solving problems.'

Catharsis brings relief from tensions created by these emotions. "Not all kinds of intervention promote catharsis. It takes a particular kind." In the studios, such interventions are nonevaluative, supporting, encouraging and invite the student to talk more and express his feelings. "Breaks in the flow of conversation involving gaps of silence are understood for what they are as indicating points of impasse that the student must be given the opportunity to solve the faculty's reaction in a patient and supportive way rather than rushing

over them. These are the basic attitudes behind the cathartic interventions. There are many human skills involved that have been in the technical literature. These are skills of rephrasing, reflecting and communicating acceptance by posture, gesture, smile and others.

#### CATALYTIC INTERVENTION

The catalytic intervention is analogous to the chemical agent which speeds up a chemical reaction without being changed itself.

The teacher intervenes in the student's problem definition effectiveness of the solving process with the aim of increasing the student's behavior in solving problems.

"Two different but interdependent assumptions underlie this method of intervention that additional data is required in order that a significant input can occur in changing the rate of what is going on, of whatever is preventing problem solving from being at a higher quality can be reduced by utilizing information that is available, but that for some reason is not being brought to bear on the particular dilemmas at hand. The second is that by making the student examine his own process, the teacher can make the learner change his behavior without further education."

The teacher carries out this process by first diagnosing the student's problem through tests which feeds back the score to the student and helps him to interpret the meaning of the scores. The meaning expressed in terms of similarity and differences to successful cases of precedence that are similar. The teacher avoids making decisions for the student about what he should do or not do. He

advises only on procedural issues and how he is to use the data to reach his own conclusions. "In the catalytic approach to intervention, the teacher (consultant) enters the situation and through interviewing gathers information about interests, needs and problems as they are seen by the student. He then designs a data-gathering program and implements it, completing this phase of the intervention by feeding back to the student new or categorized data." While the student is processing the data, the "teacher" provides process consultation which means that he facilitates the student's efforts to understand the data and to take action upon the basis of them. He may do this in two ways. One way is through technical aspects of data interpretation. The other way is through aiding the student to learn to be more effective in terms of sound behavior. The expected outcomes are that the student will (1) see his situation in a more objective way, (2) comprehend the actions necessary to increasing the effectiveness of the situation, and (3) have better interpersonal and decision making skills with which to implement desired outcomes.

#### CONFRONTATION

Sometimes the values and assumptions a student embraces are self-defeating or ineffective and must be brought to a plane of awareness in order for him to break away from them. The confrontational teacher's purpose is to face the student with contradictory, inappropriate, invalid or unjustified assumptions, often revealed in his here-and-now behavior in such a way as to aid the student to gain an explicit understanding at what these are and, at the same time, to see optional

values and assumptions which, if he were to get on them, would increase effectiveness.

Confrontation involves challenging, and in this way getting the student to face up to a reality which previously was unrecognized, ignored, disregarded or rejected. By such interventions the teacher seeks to create a sense of discrepancy, a contradiction between (1) values or assumptions that are valid in the light of research based on behavioral science findings justifiable against some general philosophy, and (2) the actual values and assumptions that are held by the student and affecting his behavior. Some of these which are hidden and unknown to the student constitute his nature. Thus, confrontation intervention attempts to surface half-hidden, unknown assumptions which when evaluated and found unacceptable are replaced by values and assumptions which have a stronger base of validity and consistency.

#### PRESCRIPTION

The prescriptive teacher, like the doctor, diagnoses his student's problem and tells the student his answer to the problem. The prescriptive teacher relies on skills acquired from a body of knowledge or from years of practical experience. He operates on the premise that he is well-qualified to discuss the student's true needs. By definition, the student himself lacks the requisite knowledge or the objectivity or both to make a sound self-diagnosis. A significant feature about this method of intervention is that it is possible to effect change in the behavior of a student even when he has given up hope. However,

this change in behavior may not be accompanied by a change of assumptions.

#### THEORY, PRINCIPLES AND MODELS

This method of intervention rests on teaching the student theories, principles or how to design models. Thereafter, the teacher helps the student use these theories, principles or models as the basis for diagnosing himself, others and environment, and so design developmental strategies for increasing his effectiveness. The idea is that when a problem can be seen and comprehended on systematic terms involving cause and effect, it can be responded to in ways which get at the root of the problem. This method of intervention is a way of bringing systematic analysis to bear on diagnosis and solution of problems of self, others and environment. Once the student has the insights and understanding of the theories, principles and models that are pertinent to his problem situation, it can produce in him a mature basis for self-reliance.

The use of this method of intervention needs to be distinguished from other approaches that might be confused with it. For example, in intervention methods, catharsis, catalysis or confrontation, the teacher may be crystal clear about the theory behind his intervention. However, he does not teach the theory to the student. Therefore, this does not involve theory, principles or models methods of intervention because the student does not learn theories, principles or models of process.

## CRITIQUE OF METHODS OF INTERVENTION

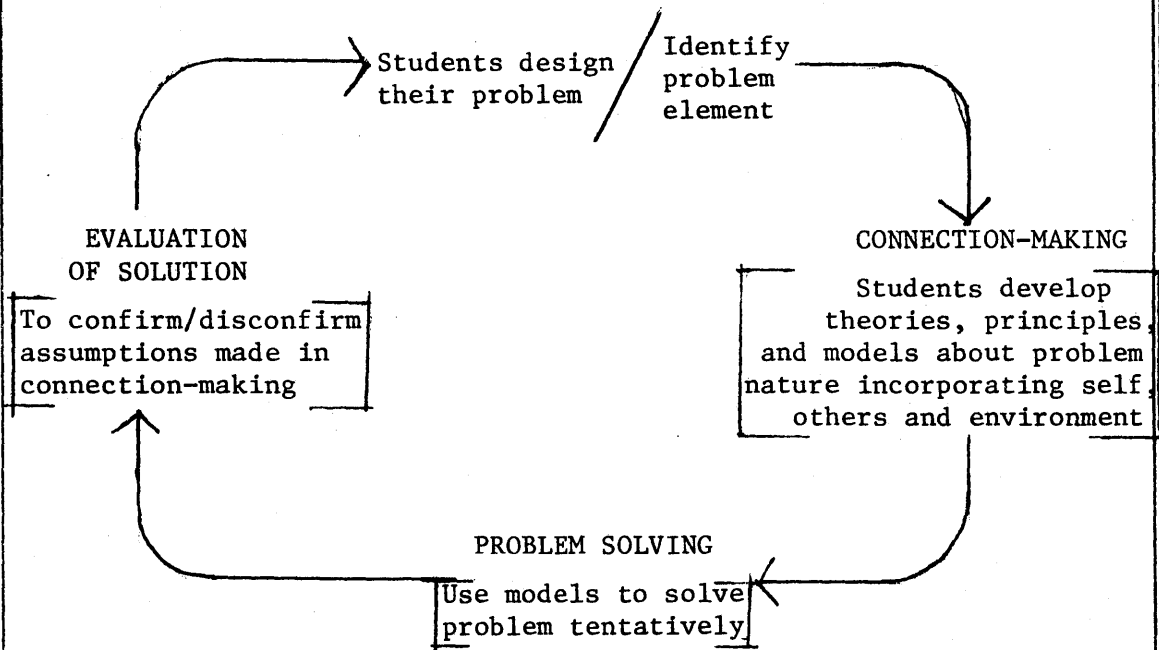
Each of these methods of intervention does not seem to meet the objectives that pedagogy must accomplish.

Also, the cathartic and catalytic methods of intervention are too weak to create the type of deep problem definition attitudes, behavior and practices listed in Chapter Four. They have the tendency of colluding with the inherent weaknesses of students, faculty and the school as a whole.

The confrontational and prescriptive methods of intervention are stronger but too abrasive and arbitrary, respectively.

The frequent criticism of the theories, principles and models methods of intervention is that it is often "too remote from the everyday momentary realities."

But this method of intervention can become more useful and in fact accomplish the set pedagogical objectives if it is put in the framework of problem definition process. This could be the case because the connection making stage in problem definition is actually developing theories, principles and models of a problem nature. (See Chapter One). This method of intervention will therefore synchronize into problem definition processes if the theories, principles and models developed in connection-making stage is used to solve the problem tentatively. The objectives of pedagogy can be accomplished only if all the conditions of a good problem definition process are present.



In addition, the class must have a healthy supportive mental environment:

SUPPORTIVE ENVIRONMENT

An effective supportive environment for achieving the above objectives in a studio or non-studio includes:

- i) The organization of the course, The individual students and faculty manage their work against the goals and plans for achievement of the objectives.
- ii) Where the goals and plans of the course must be structured to achieve the objectives numerated above.
- iii) Decisions must be made by the students and near the sources of information regardless of where these sources are located.
- iv) The reward system is such that students are rewarded for both short and long term range developments toward the overall objectives.

v) Communication among the students and between the faculty and student is relatively undistorted. The students and faculty are open and confronting. They share all their relevant facts including feelings.

vi) There is a minimum amount of inappropriate win/lose activities among the students and between the students and faculty. Constant effort exists to treat conflicts as problems subject to problem-solving methods.

vii) There is a high clash of ideas about task and relatively little energy spent in clashing over interpersonal difficulties because they have been generally worked through.

viii) The students and faculty see themselves as interacting with each other and with a larger environment. The class is seen as an open system.

ix) There is a shared value, and the faculty's strategy is to support it, trying to help each student maintain his worth, integrity and uniqueness in an interdependent environment.

x) The student operates in a problem defining-solving way. There are built-in feedback mechanisms so that the students can learn from the experiences of having solved problems. In this way the students will be consciously renewing.

xi) The problem set must be genuine but resolvable and must actively stimulate the development of the student's mind.

xii) The assumptions held about individual change must be consistent with those attitudes, behaviors and practices of problem

definition. For example:

a) The problem, solution and method must be owned by the students in order to generate enough commitment to the learning process.

b) The process must be managed by the student and the teacher.

c) The change must have an extended time-frame.

d) The educational objectives must be related to the individual student's goals. Changes for the sake of change are not to be maintained.

For real attitude to change by students to take place and stay maintained, three conditions must exist:

1) The student must have a high level of dissatisfaction with his own problem definition technique to mobilize energy toward some change.

2) The student must have a clear picture of the desired problem definition technique.

3) The student must have knowledge of the practical first steps toward this desired problem definition technique if energy is to be mobilized to start.

#### THE IMPLICATION FOR STRUCTURE OF ARCHITECTURAL COURSES

It means that courses in architectural education should be run by processes of planned change. A typical course or studio, for example, will have three phases.

Phase One:

In this phase, the goal is to increase the level of the students' dissatisfaction with their own problem definition solving techniques.

The mechanism for doing this is simple. The course begins by giving the students a series of genuine but resolvable problems to define and solve. The students should keep detailed records of:

- 1) self - their own attitudes, behavior, practices, theories.
- 2) others - the client's and teacher's attitudes, behavior, practices, theories, needs and expectations.
- 3) environment - non-personal things like site, budget and building codes.

These records will then be looked over or diagnosed by the students themselves with step by step guidance from the teacher. The step by step processes are the episodes of problem definition.

The attitude of the teacher in this phase is of great importance. Since the goal of the phase is to increase the students' level of dissatisfaction with their processes, the teacher must find ways of using Schein's unfreezing mechanism to:

- 1) disconfirm the students' attitudes, behaviors, practices and theories recorded.
- 2) induce some guilt-anxiety by comparison of his solution to an actual ideal situation.
- 3) the teacher must create an environment psychologically safe and free from threats and barriers towards change.

The above process should be discontinued and the next started

only when the student has reached a high rate of dissatisfaction with his own technique of defining and solving problems.

Phase Two:

The goal of this phase is to present to the student the desired problem definition technique.

The mechanism again is to use problem definition techniques to present it. Cases of precedence are presented using the step by step episodes of problem definition techniques.

Medical practitioners, mechanics and police detectives could be brought in to explain to the student how they go about diagnosing their own problems. This could be helpful to the students because the advocated problem definition in architecture, problem diagnosis in medicine, mechanics and detective work are similar as they all stress both process and solution. The students could learn from hearing how other professionals define problems.

Phase Three:

The goal of this phase is to provide the student with the practical first step to internalize and personalize the desired problem definition technique presented in Phase Two.

In this phase unlike Phase Two, the teacher provides a demonstration of the use of the technique so that the student can imitate him in defining and solving his assigned problems. In this process, the student keeps much the same records as in Phase One. The teacher also creates as much as possible the same psychological environment in Phase One.

Traditional architectural teachers in the beginning are likely to resist these suggested education reforms. They might resist change because these suggested reforms might be considered a threat to their security. Therefore, the first change strategy is to communicate to the teachers that these reforms are not threats to their positions and that in actual fact reforms are to their own interests, those of the students and the professionals as a whole and that training and programs will be provided to enhance a smooth change process.

The content of the program will be based on the assumption that the more clearly a faculty is able to:

- 1) distinguish between environments which will produce different behavior and outcomes for different students,
  - 2) identify his role as a teacher,
  - 3) what he brings to his relationships with his students, and
  - 4) what specific issues fall around his personal behavior and how he determines his intervention strategy,
- the more likely he will be able to design his teaching environment effectively.

#### WHAT HE BRINGS TO HIS RELATIONSHIP WITH HIS STUDENTS

- He has a set of values and assumptions about a good problem definition technique and how these affect his behavior.
- He has a set of attitudes towards the educational objectives of the school which affects his behavior.
- He has a set of attitudes about the potential for growth of his students.

- He should have a set of skills for:

- system diagnosis.
- situation analysis.
- change strategies.
- handling resistance to change.
- theory interpreter.
- designer of curriculum and pedagogy.

- He has some amount of knowledge about:

- technical architectural information.
- the nature of human nature.
- motivation theory and principle.
- the nature and dynamics of small groups.
- styles of pedagogy and their consequences.
- the processes of change and resistance of change.
- organization development - planned organizational change.
- problem definition.

If the teacher intervenes in his student's learning process, he handles all the above skills and knowledge that he brings to the class.

In addition, he is faced with establishing a working relationship with every student. He needs to decide very early when establishing a working relationship with his students, how he will handle:

- strong expectations of his student about his demonstration of problem definition technique.
- sharing of values between himself and student and with the rest of the school about problem definition and solving.

- design of the course problems he will assign his students and the change process of his students, accepting his students' initial definition of the type of questions asked, types of information they collected and where they were collected.
- sharing of feelings and attitudes towards the course task and towards the educational objectives.
- what kind of role (advocate or process consultant) in the time-frame of the three phases of a course.

#### TRAINING WORKSHOP

Assistance can be given to the faculty through conducting frequent laboratory and development programs. The laboratory method is much the same as described for teaching students. The difference between the two laboratories is while the student laboratory deals only with problem definition, the faculty laboratory will deal with both problem definition and techniques of communicating it.

## CHAPTER SIX

In this final chapter, two examples have been used to demonstrate how these suggested curricular and pedagogical reforms could actually be affected.

The first example was obtained from a Level III system studio which I observed for eight weeks.

### EXAMPLE ONE

**CONTENT DESCRIPTION:** The studio was given jointly by two faculty members. The studio met formally for twelve hours in the week (four hours in a day for a three-day week). Eight students participated. Each of the students have had at least four terms of design studio experience. The designer problem goal was that:

The students were expected at the end of the studio to come up with:

- 1) a set of building components and methods which will

- achieve:
- low ownership cost buildings at first cost competitive with conventional construction.
  - rapid construction to reduce costs and allow occupancy ahead of conventional construction.
  - building better suited to meet use requirements of occupants.
  - innovation in the building materials industry.

- 2) a set of drawings which demonstrate the above program goals.

### **COURSE OBJECTIVE:**

The objectives of the studio were:

1) to provide an opportunity for the student to learn system approaches to design by actually applying them. The faculty interpreted system approaches to design as comprising:

'a process of matching physical and organizational resources (the realities of material and equipment, delivery and assembly techniques, labor's manpower and skills, economic and governmental structures) with the identified user's needs to achieve within the limits of the budget the optimally balanced activity shelter.'

'an approach to architectural design which considers all elements of the design object as a total unit. The process includes performance design which begins with predicting environmental performance and performance characteristics required. It progresses iteratively along an increasing converging performance spectrum of choices towards a final system synthesis.'

It is an approach which considers:

'shelter and security as the primary function of building and that the most demanding challenge facing the profession at this time is to build, minimizing the use of scarce resources, materials and energy, both in the fabrication of buildings and in their long term use.'

2) By participating in the studio, the faculty hoped that the students would acquire:

i) the ability to develop system hardware components. The

system hardware components comprised the building structure, HVAC, lighting, ceiling, electrical distribution, flooring and space divider. This ability will come through by the knowledge of the rules which govern the use and application of the above mentioned components through their use in design.

ii) the ability to design performance specifications to govern development of the system hardware components.

iii) to have knowledge and understanding of 'list cost analysis' so that the student can be more effective in designing buildings with low 'ownership cost'.

iv) to have knowledge of fast-track and construction management techniques.

#### MEANING OF THE STUDIO COURSE

The outcome of the studio I observed was different from the conceived intentions of the instructors. The conceived intentions of the instructors were to impart these goals to their students:

1) That the form of a building is primarily determined by the users needs, the construction hardware systems and materials and the cost consideration.

2) That system approach is the most efficient design technique for achieving the program goals (above).

3) That by making the students use the system approach in their design problem they would come to see its value and use it thereafter.

However, it turned out that:

1) The students did not use system approach to design. Instead,

they used model one D (see model one in Chapter One).

2) The studio stressed that the form of a building is determined primarily by the hardware system and site consideration which were the only variables the students worked with.

3) That the students did not know what system approach to design is and so have not changed their design techniques.

#### HOW PROBLEM DEFINITION WAS USED

In the phase one, the students were provided with a detailed program and a summarized edition. During the first half of the semester the students worked on developing building system hardware to specifications given by the program. The students worked in four small groups of two students each. Each group was assigned a specific task: 1) structural components, 2) electrical system and doors, (3) lighting and ceiling, and 4) HVAC.

Each group produced alternative solutions through circles of problem solving - evaluation episodes. Five weeks later the students commenced the second phase. They worked in two groups of four students each. Each worked on a set of ideas through circles of iteration of problem solving and evaluation on two separate building systems. The hardware ideas carried over from phase one.

The design model used was similar to model one D; see model one D in Chapter One. The students accepted the program with minimum uncertainty and consequently the whole process was a problem solving one.

#### HOW COULD IT HAVE BEEN USED

A problem defining-solving process should have been used and if it had been used, it could have made a difference in the types of solutions to solve their problem.

Problem definition process could have been used in the following way:

Phase One: All four groups should have separately researched to identify the elements of the problem - self, others and environment.

Phase Two: All four groups should have held a joint work session to report their findings. This work session should have been devoted primarily to making connections between the elements they identified. In this process they should have attempted to define the nature of the problem or model the problem situation, establish evaluation criteria and guide for achieving two alternative solutions and examined the consequences of the guide for self, others and environment.

Phase Three: The students should have returned to their separate groups to attempt tentative solutions using the guides established in Phase Two.

Phase Four: The students should have in joint work session

evaluated their solutions, develop new understandings of the problem and redefined the problem.

Phase Five: The circle of phases to four should be repeated until the student feels a sense of accomplishment.

#### SUGGESTIONS FOR REFORM

This studio can be reformed by teaching problem definition process to the students and the students should be encouraged to apply it. The problem of the design studio should be genuine and resolvable. The instructor should include in it curriculum supplementary courses which teach system diagnoses, situation analysis, change strategy, handling resistance to change, understanding cultural norms and values.

The structure of the studio should be modeled to the laboratory setting described in Chapter Five.

## EXAMPLE TWO

This example was obtained from a seminar in special problems which I observed for seven weeks. It was a seminar in special problems in building technology (circulation), entrances and doors which was given by a faculty member. The seminar met for two hours in the week and 21 students participated. It was restricted to students who have had at least two semesters of architectural design studios.

The objective of the seminar is to give an opportunity for both students and faculty members to:

1) discuss the 'formal' and psychological implications of some physical elements in building which are functionally complex and relating these building elements to their experiences and discussing it openly.

2) have the opportunity for growth through open and unbiased discussion of their experiences with the use and design of doors, circulation etc.

In the seminar the following topics were discussed:

- the concept of journey as adventure, anticipation, pace, rhythm, choreography, views and panoramas.
- changes of direction and levels.
- solving functional problems in circulation.
- the entrance as an inter-model transfer point.
- the act of entering building.
- architectural elements of entrances.
- concepts of wall and doorway.

- horizontal and vertical circulation.

#### MEANING OF COURSE

The instructor's intention is to teach the students that human considerations are of primary importance in the design of a building or building part.

It also enables the instructor to effect growth through talking about self, others and environment in the contact of personal experiences.

#### HOW PROBLEM DEFINITION WAS USED

The course was organized on the basis of weekly assignments/home-work to students and the instructors regular weekly presentations. The assignments given to the students were of a sketch problem nature which drew answers from personal experiences.

A typical seminar session comprises the following phases:

Phase One: a) The instructor presented his cases from personal experiences and b) the students contributed thoughts, observations and questions to the presentation.

Phase Two: a) The students presented their solutions to the weekly assignments and b) the instructor and students contributed thought, observation and questions to the presentation.

Quite often these presentations and discussion that followed after did not talk about the problems which were defined and solved and the underlying assumption of the solution the students produced. The discussions were focused mainly on products. Consequently, the changes in behavior were not accompanied by changes in assumptions.

#### HOW PROBLEM DEFINITION PROCESS COULD BE USED

The students could use problem definition to define and solve their homework problems. They could also use the format of problem definition to present their solutions in class. The discussions that followed the presentation could also use problem definition format. Thus, if problem definition is used this way, we shall have a series of cycles of iteration of problem describing and problem solving which starts with the students using it outside the class. The advantages of using problem definition in this format are 1) that an increased awareness about the interaction between self, others and environment will result, 2) that the students will learn to use it by applying it, and 3) that changes in behavior of the students and faculty will be accompanied by changes in assumptions.

#### SUGGESTIONS FOR REFORMING THE SEMINAR

The reform of this course could be made as follows:

- Specific problem situations that are genuine and resolvable could be used as case studies for student assignment. For example, the circulation system in the student center at M.I.T. could be used as a case or similar examples of problematic situations.
- The student should be taught problem definition process as the first phase of the seminar by using the laboratory method.
- Presentations and discussion in class should use problem definition format.

APPENDIX

INTERVIEW QUESTIONS

During the interviews with the practicing architects in Cambridge, the following questions were put to them:

- a) What project will you want to talk about how you went about defining the problem (preferably a school or house design)?  
What is the design problem?
- b) How did you go about defining the design problem? State, describe and map out the stages (taking note of events in chronological order) you carried out to define the problem from the very first contact with your client or even earlier, if there was an earlier stage. Please be very specific.
- c) At which points in time did you feel a sense of frustration? What is the nature of this frustration? Why? How did you overcome it?
- d) At which points in time did you feel a sense of accomplishment? What is the nature of this accomplishment? Why?
- e) As a general remark, what factors (activities, stages, indicators, skills) do you think influenced your effectiveness most in defining the design problem? Please rank order and give your reasons.

In interviews with some members of the M.I.T. faculty, these additional questions were put to them:

- f) Do you teach problem definition?
- g) If you do, then how do you teach it?

## METHODS OF IDENTIFICATION OF PROBLEM ELEMENT

### QUESTIONING OBSERVED PATTERN

To get entry into the problem begins by questioning. Usually it takes courage to begin to ask questions. But it pays to do so.

Some basic questions are:

- a) For what? For whom? In what context? How? Why?
- b) What questions do I ask? What information do I collect?  
Where do I collect it?
- c) What types of change are desired? Is change of
  - Attitudes? Of whose?
  - Behavior? By whom and to what?
  - Practices of work?
  - Knowledge/Understanding? Where?
  - Of organization procedure? Where?

### SYNECTICS/FORCED RELATIONSHIP

- W.J.J. Gordon (Synectic Education System)

Synectics uses three operational mechanisms, each metaphorical in character to evoke both strange and familiar elements of a problem context. Three metaphorical forms are used within the discipline of a simple flow chart. Synectics asks, "How is this thing like that thing?" The similarities uncovered provide new viewpoints of the problems being compared.

Forced relationship asks, "What would result if you combined or joined this thing to that thing?" and the conclusions provide deeper insight into the roles of both "components".

"According to Gordon, the four states of psychological interest in the creative process are:

1. Detachment and involvement  
Getting outside of and inside of the problem
2. Deferment  
Tolerance for input until all decisions have been considered
3. Speculation  
Questions, suppositions, 'dreams'
4. Autonomy of Object  
The product sought becomes the process experienced;  
process not product

Three Mechanisms are used to facilitate such behavior:

1. Direct Analogy  
Finding out how the subject is like other things
2. Personal Analogy  
Role-playing in various human, animal, vegetable, mineral and abstract contexts
3. Compressed Conflict  
A search for problems within the subject; looking for something to solve

Synectics operates with a psychological attitude that it is easier to solve other problems than it is to solve our own problems. It therefore asks us to "get outside of our problem" so that we might get deeper into it ... to develop insight by using outsight.

The key to Synectics is the work 'stretch'.

In a typical "excursion", three stages are experienced.

(1) Analysis (2) Stretch (3) New Viewpoint.

In Stage 1 we state existing viewpoints  
we analyze the problem and purge our minds of  
preconceptions, and,  
we clarify our viewpoint

In Stage 2 we stretch away from the real problem into other  
areas using all three "mechanisms"

"In Stage 3 we bring out new experiences back into a relationship with the original problem and force a new viewpoint while forcing possible implementation proposals."

#### MORPHOLOGICAL METHODS

- Don Koberg

"One special kind of model which is useful in visualizing 'whole worlds of potentials' of things is the 'morphology'. This form of structured information is a way of organizing the attributes or components of a subject into a larger interrelationship.

##### 2-DIMENSIONAL MORPHOLOGY:

1. List the problem attributes (variables)
2. Categorize the attributes and make separate lists of each.
3. Place the lists of categorized attributes side by side
4. Determine all the combinations which can be derived by taking one attribute from each list

The 3-D Morphology uses larger categories by which to organize the attributes. Then, depending on the form of the model (cube, rectangular, solid, or polygonal solid) the complete possibilities or potentials of the subject is found by examining all the relationships found at each intersection or "cell" formed by the meetings of attributes.

Since most 3-D Morphologies have so many combinations, it would take lifetimes to examine them all and they, therefore, display total scopes of problem situations.' "

#### CASE HISTORY METHOD OR PRECEDENCE

- Don Koberg

This method deals with the critical examination of the solutions which others have implemented to problems similar to yours. To use it alone as the source of information could be misleading, to use it as an additional source of information could be very informative.

"i.e., it just doesn't make sense to avoid looking into what others have done. Although revolutionary developments which deny history are possible, it is evolutionary growth that is probable.

"Once again, make a list. This time your list is of previous solutions. And, after each entry, include some critical comments about each of them. Try to be as "whole" as possible, avoid prejudice by turning your subjective reactions to objective measurables. (The library is a good place to begin because most ingenious solutions are recorded in magazines and journals - if not in books.)"

### MAKING CONNECTION

#### BRAINSTORMING METHOD

- Alex Osborn
- Don Koberg

"Brainstorming is one of the most useful and misunderstood of the ideation methods. It is useful because any group of 4 to 12 persons can quickly learn to manufacture ...connections... for any problem situation in very short periods of time. Fifty ideas in five minutes is not an unusually large number using brainstorming rules. It is misunderstood because the name has become synonymous with any single idea and people mistakenly think that they can produce ideas in any session they choose to call a brainstorming session without following the idea-generating rules.

The originator of brainstorming, Alex Osborn, lays down four requirements for all who participate in a session. Anyone can learn to apply them. But, if ignored, the session is automatically retarded.

1. Defer judgment. (Criticism comes afterward)
2. Free-wheel. (Hang loose.)
3. Tag on. (Don't wait for an idea. Make another one out of the last one given by changing it in some way.)
4. Quantity is wanted. (Don't hold back for a minute.)

Restrict the sessions to about fifteen (15) minutes at most, and be sure everyone is familiar with the problem before beginning. A follow-up session, using the same participants on the next day or so, is a good way to pick up all of the 'after-thoughts'."

#### MANIPULATIVE VERBS

- Don Koberg

"Another Alex Osborn method uses a series of words to force us

"to visualize our subject in unique (innovative) ways. We use the words (verbs) to manipulate the subject by changing its position or by altering its shape, function, size, etc. Manipulative verbs can produce a series of ideas in a short time. For problem solvers who must work alone, this method is a 'natural'.

		<u>HOUSE</u>
Osborn's	Magnify	Mansion
verbs are:	Minify	Pup Tent
	Rearrange	Sleep in Kitchen
	Alter	Two Living Rooms
	Adapt	Boarding School
	Modify	No Living Room
	Substitute	Cave
	Reverse	Live Outside
	Combine	Houseboat

But other verbs which might also be used are:

Multiply	Distort	Fluff-up	Extrude
Divide	Rotate	By-pass	Repel
Eliminate	Flatten	Add	Protect
Subdue	Squeeze	Subtract	Segregate
Invert	Complement	Lighten	Integrate
Separate	Submerge	Repeat	Symbolize
Transpose	Freeze	Thicken	Abstract,
Unify	Soften	Stretch	etc."
Dissect			

#### ATTRIBUTE ANALOGY CHAINS

- Don Koberg

Connections can be made "by applying analogies to situations. The key to finding an analogy is simply to force a relationship between your problem (elements) and anything else. You can find something alike about any two things. An obvious example is the fact that, when the sun shines, it adds a similar component of yellow light to everything in its path, helping all of those things to find a harmonic connection.

"If you use your list of problem attributes to guide you, chains of analogies can easily be attached to each attribute.

For Example:

Assuming the problem is to improve a FIREPLACE, its attributes are:

"NAME: Fireplace  
FORM: Geometric, angular, conical, etc.  
FUNCTION: Heat room, psychologically soothing, etc.  
COLOR: Black, brick red, etc.  
MATERIAL: Steel, masonry, etc.

ANALOGY CHAINS (SIMILARITIES)

NAME: Combustion chamber, tea pot, auto engine, cigarette lighter, etc.  
FORM: Architectural constructions, crystals, prisms, etc.  
FUNCTION: Cat on lap, robe, intimate friend, etc., etc.

IDEAS PRODUCED

Change name to energy transformer.  
Try forms which are derived from crystal structures.  
Use robe insulation principle to conserve radiant heat, etc."

RESPONDENT A

What is the design problem? How did you go about defining the design problem? State, describe and map out the stages (taking note of events in chronological order) that you carried out to define the problem from the very first contact with your client or even earlier if there was an earlier stage. Please be very specific.

The first contact with the client was many years ago and I wasn't really involved in the design of the drama building until a later date. The drama building was for a college. I attended this college many years ago. I worked with the drama department many years ago, designing some stage set for them for their drama productions. During this time I got to know the director of the drama department. Now I am working with him very closely in the design of this building. That was one of the first stages with the first contact with the people in drama.

About two years ago, the reason I got into it again was that the college needed some facilities for drama and had been thinking about it on their own. This college is located in the midwest. They have been thinking about it a little and have defined for themselves what they needed. The president called me because he knew me from other situations. He said, "we are interested in a drama building." They were a little helpless because they had some idea of what they wanted but didn't know what the next stage was. So I offered to come and talk to them about what the next stage was. I suggested I talk about what their needs would be.

Their first idea was based more on a projection toward a type of building without even going into analysis of the function they wanted to accommodate and specific needs. They had the idea of putting a drama barn like what one finds in the rural areas. That was their thinking at the time they called me.

I then began to talk about some of the things in drama which I felt were important considerations and that they should be thinking about. In an effort to get them to think of the various activities they wanted to have, the kind of size, the kind of function, the type of drama they wanted to produce, the kind of social relationships of people in the building and the finances if it. The location on the campus - that turned out to be quite important.

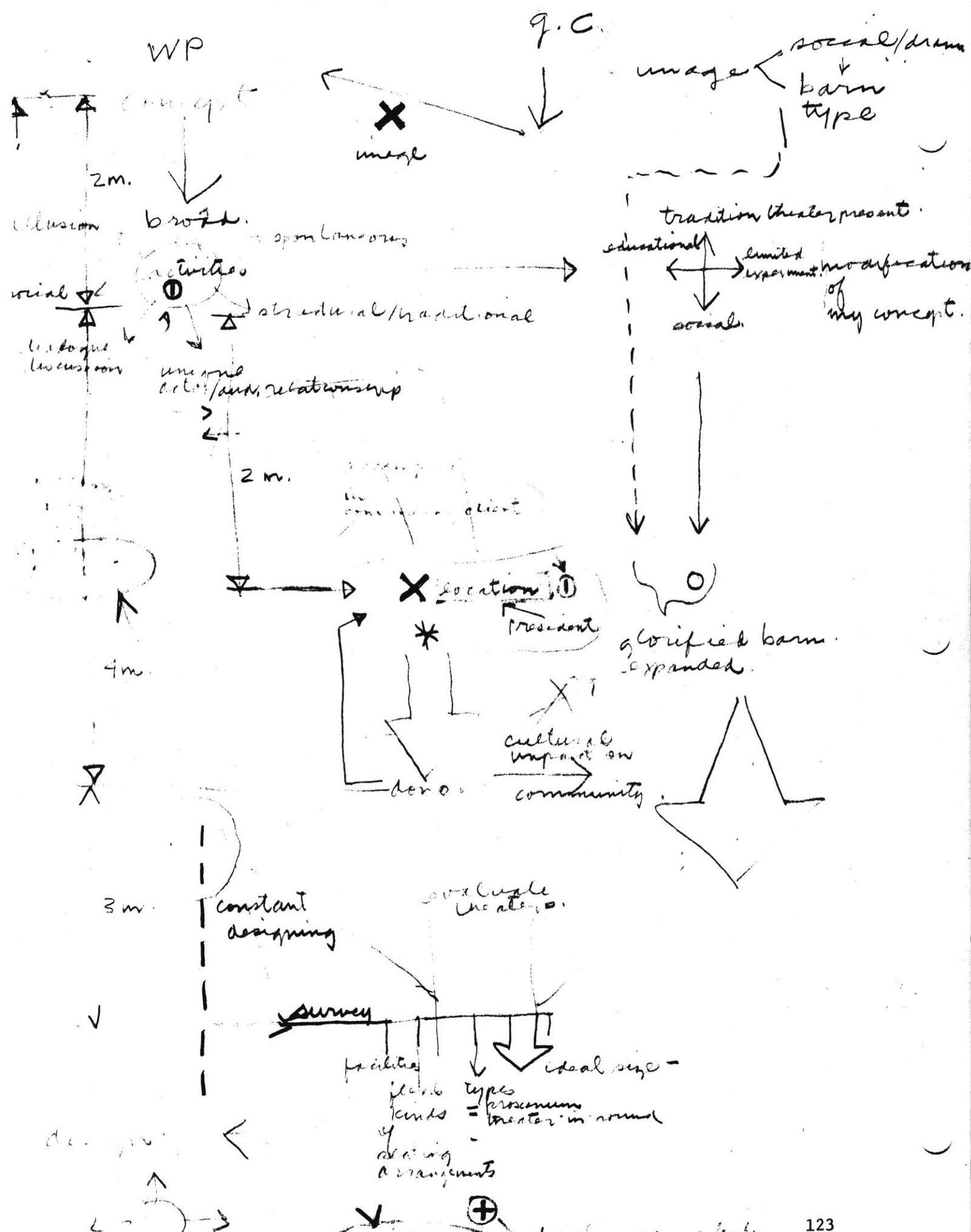
I think the first thing I presented to them was my concept of what a drama building should be since I already know the college, the students, the site. I presented this in a written form. They did not anticipate it to be a so involved project, but thought it to be a very simple utilitarian building. So when I presented my concept which portrayed drama activities as more extensive, they immediately said they have no need for such a kind of thing.

What I did was talk to the head of the drama department and college president about the kind of dramas they had produced in the past, the kind they will produce in the future. We talked about what kind of idea their conception was about the department and how it would serve the need of the campus: Do they feel it to be just to entertain, or to be a major educational facility, or professional drama produc-

tion facility or where the students could spontaneously produce their own dramas at any time of their own?

We talked about all these kinds of things and began to realize that drama was not what they can just push off, just to entertain or just for social-cultural reasons. They began to say that drama was such an important thrust for their educational policy, for students to communicate in drama was one way of teaching students one way to communicate, develop expression in many ways. Suddenly the whole concept of drama had expanded. It was because they had not really looked at it in enough detail.

One of the first considerations I felt we should get involved in was the location of this building. Their first reaction was to locate it on the remote area on the campus. Because they thought it should be a very cheap and inexpensive structure. They felt it should have a feeling of retreat or remoteness and barn and which you have to walk a distance to get to. But I felt differently about it in view of the importance they were beginning to attach to it as a facility to help students' education and also in the students meeting spontaneously between classes and so on to discuss and communicate that it should be very close to the heart of the campus. So that it will be a place the student will go in a natural way. So I presented the idea that it should be located near the heart of the campus. Very near the library and the fine arts building was a convenient spot on the campus for it. They were reluctant at first but after more consideration, they gave in.



Please map out your problem definition process.

At this time I felt their concept was still too narrow and they still thought of a glorified barn. At that point, something that was not anticipated came into the whole thing - that was, someone else got interested in this whole thing - a donor. The donor was very interested in drama and was donating a large sum of money into this whole thing but had some limitations on his gift.

The donor added small ideas - he said that the new facility must have a cultural impact to the community. He was not interested in the small concept of drama, but my expanded concept. This caused the college to expand in their thinking. So we're back to my concept. We started to work again on my concept.

The head of the drama department and I went to visit many theatres. We started to evaluate theatres in terms of facilities, feasibility of its kind of seating arrangement, types of productions which would include things like proscenium and theatre in the round and modifications of the two. We started to look at the size. Suddenly the size started to become important.

We evaluated this in terms of size - of people that is best to communicate with? What kind of relationships can best occur?

At this point I began to work on a design with all this information - a modified concept.

At what points in time did you feel a sense of frustration? What is the nature of this frustration? Why? How did you overcome it?

Oh yes, not very much so, not frustrations. A feeling that

things were being talked about that I didn't agree with. It was right at the beginning when the concept that was given to me when the initial contract was made. I immediately felt that this is not the way I would approach the whole design, nor was I in agreement with the kinds of decisions they were making. (Let's mark these frustrations with a cross [x]) Conflict of images.

The problem I felt that the image of the type of building had proceeded the sense of what was really needed. Secondly, they were interested in me in their sense of architect to design for them their preconceived type of building. Of course, maybe some architects would have liked to, but yet I felt they were open enough to listen to what I had to say and I felt I did not want to cut off any talk about it. I indicated I was interested in the college and went to talk about it. The resolution at this point was that we were willing to talk.

Another point of conflict was the area of location of this facility, where their image of it was, was a remote isolated place; I felt there was a conflict of location. I felt that for the need they were talking about, that the location they were talking about was not in their best interest. And again, they were reluctant to consider my suggestions in that. But I think they did finally come around to thinking of some of the things. I think this donor helped. He was not interested in the remote location of the facility. In all honesty, he added to that and as well as my contribution. Plus that, I think I was able to convince them that the place would have extra uses if it was located where I suggested. Again this was solved by reasonable

discussion. Again, the president of the college is a very open, liberal man and other persons in the college tended to be more cautious. He was able to sense at the beginning what he should be thinking about and expanded and advanced each stage by his contributions. So we might also put in here that the president helped to solve that.

In stages where we were thinking in terms of theatre, there was no conflict. We were developing in steps. But except for a number of small points, we had some problems in priorities:

- 1 - relationship to size - building orientation
- 2 - the use of the building
- 3 - the range of important functions.

I felt pretty strongly that the building should relate in an obvious way to the fact that it was located in the center of the campus.

Because of the central location of the building it tended to be so important - in actual fact, one of the most important buildings on the campus. At first, he was not interested in looking at this for what it meant for the whole campus; the way it looked at the campus, the way it looked at other buildings. The most important places where the students gathered. I was interested that the orientation, lobby areas and entrance be a consideration of student patterns of congregation. They were more interested in the relationship of the entrance to the parking lots and that tended to deemphasize that.

Suddenly the college started to think that in view of the fact that a new building was coming they began to want to put in many functions into this building: everything from classrooms to faculty meeting,

art gallery, to the point that they were losing focus of what the main facilities would be or what kind of provision should be made for them. They were beginning to do nothing well. So I needed to get to them on that to prioritize and plan.

Here I think they began to think of minor facilities - things like dead storage were taken as the important consideration. I'm not saying that they are important, but should not take priorities. I felt that since we had some major limitation on budget in size and site that we should concentrate on those things that really mattered. Those things that really mattered that we were able to agree on were:

- student meeting and place to interact.
- that drama was a priority.
- classroom conference rooms were secondary.

So that was the major conflict. Some of these things I felt I had to modify because of the limitation of the budget.

From my initial concept which was pretty broad, not necessarily an expensive one, I think it tended to treat drama as exploratory and experiential much more than the college felt a need for. Although at first, they were very traditionally minded.

I also think that the college really wasn't aware enough of the possibilities that people have in creating spaces, creating experiences. They didn't have knowledge of thinking and talking and designing for that kind of thing. The reason why, I don't know. Maybe they don't, within their experience, know the relationship between environment and people, and the kind of things that can be meditated and

changed. They think sometimes in terms of people alone. They don't relate themselves to their environment, and when they think of environment, they don't relate it to people. I think that was true here. I think not only I, but some other people were to show them how inter-relationships are possible in design considerations.

Generally they felt appreciative of some of these thoughts that were presented to them. Whether, if they had received the building and had seen that there were such relationships, interactions occurring, probably they would have noticed it. They were not able to anticipate that type of thing. Maybe this is where architecture has a role.

At which points in time did you feel a sense of accomplishment? Why?

Let us call sense of accomplishment cycles. Certainly, I did not feel a sense of accomplishment at the beginning. Part of accomplishments felt was when the college was able to think along with me and think together. That was one kind of accomplishment. The other kind of accomplishment is when I just felt that I have completely explored all solutions in my own mind and have written it down, drawn it and it seemed to be satisfactory. So there are two levels. Personal accomplishment is the cycle with an I.

The first one was not so much an accomplishment as I was not able to convince them. The accomplishment when the donor came was not as a result of my doing. So I cannot really call that an accomplishment. There was an accomplishment when we started to agree on things and visited the theatres and when I was able to convince them about loca-

tion. There I really felt a real sense of accomplishment (personal accomplishment).

Why did you feel a sense of accomplishment at each of these points?

The sense of accomplishment I felt here was that I had been able to conceive in my mind an idea that was an expanded idea. It was not a traditional idea. It was in a sense a vision or visionary, or an idea which has a vision about it. It was a creative moment.

The accomplishment here may have been partially a verification of the fact that on working on these specific things, that this original was appropriate and positive. I didn't find in going through here that I was working in abstention of those ideas.

One link between the two is that the latter reinforced the former - the vision. The other sense of accomplishment was with the design. This was a result of hard work and ingenious thought. It worked. It involved a lot of work, constant evaluation, arranging, considering a lot of possibilities. I should also say that my designing didn't start way off back here. I was of course designing already.

As a general remark - what factors (activity, stages, indicators, skills) do you think influenced your effectiveness most in defining the problem? Please rank order and give your reasons.

If one looks at it in terms of success, the architecture for extention of yourself and client, the first thing and most important is vision/idea. You call it idea or concept. In this design, although it didn't succeed, it certainly is what motivated me to think that the building has possibilities.

- vision of interaction
- vision of people
- vision of a place

As opposed to the idea of providing for facilities which the college was initially thinking about. So the college and I started differently. I started with the idea/vision and the college with the idea of facilities; for example, facilities for drama, for science, etc.

- The comparison to other places, similar to drama buildings. This is really helpful not only for the college, but for me. This is helpful to look at possibilities, past and real world. This was also an opportunity for me to look for I did not approach this thing as an expert.

- Looking at drama. Looking at the reason for drama. I have read a lot of drama and I want to see a lot of drama to act into the whole thing. Of course the college directors have seen a lot of drama - that is his field. That was a good way to be sympathetic to the whole thing.

I would say these three are the most important things which influenced my effectiveness. However when you get into working drawing a host of other things come in.

RESPONDENT B

What is the design problem?

Answer - to design a house.

How did you go about determining the design problem? State, describe and map out the stages (taking note of events in chronological order) you carried out to define the problem from the very first contact with your client or even earlier if there was an earlier stage. Please be very specific.

In defining the problem, the first thing that happened was the way I got this job was that this man had contacted another member of the faculty. I don't know where he got this faculty member's name and asked him if he could design a house. The faculty member said he could not but perhaps I could. And so the man told me very bluntly on the telephone exactly what he wanted. I met the man and his wife and daughter.

In the course of several meetings with them we developed a program.

How many meetings?

About two meetings before I began the design but then the p.d. continued after these meetings during the design process.

There was one further ingredient here which was that this man had earlier worked on the design for a while himself and had developed some drawings -- rather crude drawings. He realized that his design was not working very well and he realized at that point that he needed some professional help. So he had done some defining of the problem

himself and had some written and drawn documents that were very helpful in determining the problem. He had some floor plans and cross sections he had drawn and very crudely, but they were there. He also had a list of things he wanted in the house and he had a list of things he liked and didn't like. And that was very helpful; it was a paired list. In addition he had some magazines, pictures, etc. of things he liked. All of that was very helpful for me to understand the concept of what his conceptual definition of the problem was.

His definition of the problem included things he liked and didn't like.

What happened after that?

I spend some time looking at the documents he had given to me and also going over the notes of conversation. I developed some kind of listing, some sort of organized program of what he thought his building problem was. I went to ask him and we discussed that. He reacted to my conversation of the problem definition we have been discussing together. As a result we came to some kind of agreement.

Please trace the different stages you went through in developing this program.

Well, it was quite a simple program for a house.

At this stage we did several things. We made a visit to the site and I took from him such maps as he had of the site which were not very good. I also took a pocket surveying instrument to the site and got some information on the slope at the site. In the meantime, he also contacted a surveyor to develop some further information about

# CLIENT CONTACTS ME



First meeting:  
Set basic design  
constraints



I study his notes,  
drawings, financial  
statement, site plans,  
magazines



Site visit

Visit to bldg. inspector; copy of building code & zoning ordinance  
" " health officer → Client went to  
" " town engineer → Brockton Edison;  
land surveyor



I make a  
summary of  
the design situation



Check summary  
w/client in meeting



Exploratory design  
sketches - 4 basic  
approaches, settled one  
one w/modifications



I develop drawings  
of agreed approach  
(furniture, structure, site, etc.)

Problems: survey not done; uncertainty about location  
of property lines, size of sewage disposal system,  
and slope



More crude surveying

On basis of crude survey,  
design work continued, but  
at slower pace



Final design drawings  
prepared

← Survey arrived; agreed  
with crude survey



Discuss w/client; added  
size to house, shifted some  
room assignments, agreed on  
increased cost ceiling, agreed  
to build ~~a~~ model to solve  
spatial problems and light problems.



Built model, MADE A FEW CHANGES AS A RESULT OF  
NEW UNDERSTANDING.



Received approval to go ahead → Client contacts  
with working drawings subcontractors

the site which we needed. The surveying is legally necessary to get a building permit. As that was going on, I had to start designing before I had the survey. So our aspect was gathering information about the site. The second of which was that we had some very frank discussions about his financial picture -- what he felt he was going to be able to afford.

The third was that through the two discussions with him and his wife, and with looking at the documents he had made already and drawings, I just went ahead in trying to organize the best outline of what his situation was. This included his financial life and a brief description of the site problem and a list of various spaces that he wanted, and in many cases plus the furniture he wanted in them. In some cases his feelings about each one of the spaces and how each one would be used, his feelings about the site and what is important to him about the site. I keep referring to the client as being him, partly because he was very dominant in his relationship with his wife and she had a very minor role. In fact, I worked rather hard to include her more in the process. His relationship to her was such a very dominant role.

How did you go about determining what budget he could afford?

He works on a salary and has a relatively fixed income. He had no other sources of income and had already talked to a banker about financing this project. So he knew from his conversations with the banks how much he could spend. He also had worked his overall figure. He worked in all this, my fees, plus the price of the land plus the

cost of building, furniture and appliances. In addition, he had an existing house that he partially owned. I think he has paid 60% to 70% of it already and he had some idea from a friend how much he could get from the sale of his existing house. So he has the financial calculations for the most part. He came up with a total figure of what he could afford to spend on his new home and everything that went into it. So he and I went backwards from that figure and we deducted from that the price of the land, what he expected to pay for appliances, for fees, etc. We came up with a figure of how much money he could spend on actual construction.

I worked with some rule of thumb of number of dollars he could spend on a square foot of house. From that we came up with a rough idea of how many square feet of house he could build. And this was the basis on which the design went ahead. The number we came up with was considerably less than the number of square feet he had shown on his plan. This was one of the reasons he needed a professional service a make the house smaller without losing the amenities he wanted in the house.

How did you acquire the rule of thumb you used?

Well, rules of thumb are not always precise and mine are not very precise either. In this case we were assuming that if he was going to do the contracting himself, he was going to save about 10% to 12% of the cost regardless of the ordinary price of construction. We were working on the figure, that time, which I think had gotten partly based on my own experience and feeling and also based on prices I had

gotten from a couple of professional colleagues as to what they were currently paying for custom built houses. I think basically that the price of a custom built house in Boston at that time was running around \$21 to \$22 per square feet. That figure seemed to be quite accurate at that time and deducting the 10% to 12% from that, we came up with \$19 or \$20 per square foot.

We further agreed that we were not going to spend a lot of money making the house with expensive materials but we were going to use cheaper materials to create more space. Do more with space, with light and shade, and sculpture. We agreed we were going to use ordinary windows and doors, ordinary exterior and interior materials but to do something interesting with them specially. We felt that this would give him maximum house for minimum money.

Please map out your process.

I felt a little insecure in mapping my process. I didn't know how detailed you want this to be.

Please make it as detailed as you can.

We made a visit to the town building inspector. This was because I had told him that it was extremely important at the very beginning of the project to have a good rapport with the building inspector and he felt it was a good thing to do. At the same time we also visited the health officer regarding the sewage disposal system and we also made a visit to the town engineer regarding the utility hook-ups because we were unclear at that time whether we would be able to get town water supply or from a well. We knew he would have to make his

own sewage system. That was why we talked to the health officer and with the town engineer to look at the water and power problem.

The client was reporting back to me periodically about the things he was learning. He was very anxious to participate in the whole process and I was also very unsure that he participated. We set up a contractual arrangement between us where he was paying me only by the hour and we were attempting to work out between us where he got the maximum service for the minimum money. He was only paying for the services he needed. So he was doing much of his own work as he could, things like contacting utility engineer, etc.

At a point, I had a summary of what the problem really was and got his approval of that summary before I went to design. So we both understood one another about what the problem really was.

At that point I went ahead to do some exploratory sketches.

How far do you want me to go on talking?

As far as to the stage you felt you had defined the problem.

Okay, this is going to be a little difficult because you do not understand the problem until the problem has been solved and the problem is solved only when the building had been built.

Okay, we will just go ahead and when it gets a little irrelevant you can tell me.

The purpose of doing this exploratory sketch design was to educate myself as to what the possibility were, what the constraints are, what the maximum square footage I could build on the site was, the rooms he wanted. It was partly to get some ideas on paper in a very

preliminary way so that the client could react to it. Words are more capable of more interpretations than pictures and to get some in pictorial form was very useful in going further in understanding where we were or were not talking about the same thing. So I did some exploratory design sketches and I think I took about four basic approaches to the point at drawing the rough sketches to show to the client. Among those four basic approaches, I actually had an approach which I thought was the best and explained to the client why I thought it was the best. We discussed some of the relative merits of that compared to the rest. These sketches and my own working notes are very "tentative". We made an agreement to settle on one approach, but if the one did work out we would return to others but with some modification.

He suggested that we turn the whole middle upside down in an east-west direction, and it really worked better. We were all happy about it. These were some modifications of the land that we were making at that time. I had come very close to showing graphic forms which satisfied the problem criteria. It also had some of the elements of his own sketches from earlier. It was quite different in many respects but similar in some respects. I think that helped him to accept that more readily.

I cannot remember specifically all that happened again. But then, I was keeping a diary of all I did. I keep this diary for several reasons:

- 1) I needed to keep track of time and energy spent on the project because he was paying directly for that and not just a percentage or

fixed fee.

2) Another was that I was interested in this project. I have done a project in quite this condition before. I wanted to have a better understanding of how long it took me to do different parts. I do have some fairly good notes on this process. Now I have to try to remember what is in those notes.

Following, I simply went back to work. I made some more developed drawings of the approach we had agreed on. In these drawings, by the time I took them back to the client again, it indicated furniture merely to give scale to the drawing so that he could understand them.

At this point we also had a possible structural scheme. I knew approximately how the structure would work. I had structured some concerns on how the structure and sewage system would sit on the site.

There is a problem developing at this point in that we didn't have the accurate survey. This was important from several points of view:

1) It was a steep and slopey site and so we wanted to get the house to the top of the slope as much as we could. And this depended partly on where the property line was because there was a setback requirement and we could not build so many feet from the line. We didn't know where that property line was and could only make assumptions.

2) We didn't know how bad the sewage disposal would be.

We took another step ourselves and went to the site to do a crude survey of our own. But this survey was done with reasonably

good equipment. We were able to locate the front property line. We didn't think our location was right because it was so far different from what we had thought previously. Nevertheless, on the basis of the crude determination of where the front property line was, I also drove in sticks at where the house would go approximately and we reserved a profile of the slope through the house. It turned out that when we did get the survey a couple of weeks later our own crude survey had actually been very accurate plus or minus six inches accuracy on the property line and on the slope.

So we were going ahead on the basis of information we were very uncertain about. So on the basis of the crude survey design work continued. But we did slow down at that point. I didn't go beyond a certain point or spend any more time on it until I had a definite survey. There is nothing worth working on without the survey indicating where things like the structural system should be on the property line slope and where sewage would be located. On this basis I went on to make the actual drawings.

At which points in time did you feel a sense of frustration? What is the nature of this frustration? Why? How did you overcome it?

I do not think I felt any major frustration until we got into the construction process. That was very frustrating because he was having too many troubles with subcontractors. It was really frustrating. There were times I wished I had never gotten involved with the project. It was very difficult and the workmanship was bad. The progress was extremely slow and I was really afraid there was going to be a major

problem with the framing contractor. In a way, some of the problems most feared didn't happen; minor frustrations which I had earlier in the project.

I had some frustrations very early because of the very dominant relationship the client had with his wife. I was worried in part because I thought perhaps the marriage was not stable. It turned out that it was a very stable marriage but at the time it appeared to me that it might not be. This is something that happens frequently with families who are building houses. They seem to try to build to stabilize their marriage. I was afraid that this was one of those cases and I was worried for a while.

I was also frustrated because I could not get enough information from her. Each time I asked for information, he would give me the information. So I felt she did not have a large enough role. It turned out to be equally a good house for both. So that was a frustration.

There was another frustration with not getting the survey when we needed it most. We wanted to have the construction started immediately after the snow left the ground. We had a very tight schedule because of lots of things we had to do. The survey was holding up a lot of things we had to do.

Of course one is always frustrated by the price. Everyone wants a little more. It's not everyone who likes a limited money supply with which to build, at least I don't. There is a problem in that the client always wants more than he can pay for. I had to make certain

major decisions before certain parts of the program could be left out because we could not afford to pay for everything he wanted.

How did you overcome these frustrations?

We overcame the frustration of the survey by making a crude survey of our own. That led to a new frustration as we thought it was wrong. But we did go ahead with it and it turned out to be right. The client at this point picked up the telephone and constantly urged the surveyor to get it finished. So we did the best we could with that.

With the cost situation, it was a very bad problem with the client. It is only a matter of being very open with the client about what the cost problems were and not letting him disregard the cost problems at every stage. You have to keep pushing the client to deal with the cost problem at each stage and understand where he is and not let him say we will worry about it later. You have to make him worry now. That is what I did and it worked out reasonably well.

With the wife, it was simply a matter that I kept asking her questions as much as I could. After a time a better working situation developed, although it was not good. After several meetings I thought I had enough information from her. I also made a particular point of listening to her comments which she offered. She had her set of frustrations about the design. I made special notes of what she said and asked and made sure that I solved those things before visiting them again.

The frustration at the subcontractors was beyond my power to deal with as he was not paying me to supervise the construction. We worked

out an agreement where I was to do the very minimum of construction supervision. I had no direct dealing with the contractors. So I was mostly studying by watching this bad situation between him and the subcontractor.

At which points in time did you feel a sense of accomplishment? What is the nature of this accomplishment? Why?

In all, there is always a small sense of accomplishment when you realize that you and the client are in agreement on certain issues. You realize you are working together and not against each other. You realize the relationship is a natural one. At each meeting where I felt that was the case, I felt a sense of accomplishment. I felt a sense of accomplishment at the end of each stage in the process. The final design drawings were the first real stage I could breath a real sigh of relief that I had done something.

The second was the end of the working drawings. By the end of working drawings, you know that the building can get built. You know you have worked all the construction drawings and that the whole thing will fit on the site and that it will be built.

I didn't think I felt any more a sense of accomplishment until the house was furnished because of so many problems on the way. I was very worried at a point when the client was unable to sell his house and he was in financial difficulty. Such was the point where the framing contractor was making a terrible mess of the house. My client merely was then investing in a very bad framing job. All these difficulties made it such that until the client moved in and the carpets

were installed in the house, I didn't feel any sense of accomplishment.

There were lots of victories along the way during the construction process, but there were too many worries, too many things going wrong.

As a general remark, what factors (activities, stages, indicators, skills) do you think influenced your effectiveness most in determining the design problem? Please rank order and give your reasons.

There was process in open conversation with the clients in trying to teach a consensus about what the problem was. I think I described that very well and so I don't need to describe it again.

There is another new thing going on now which is the undiscussed piece of the problem which is the architect's vision of what his problem with the client would be. It is like my misgivings about the wife's role.

I did decide what my role with the client would be. Largely I decided he would be a good client that I would have very few problems with but that did not turn out to be the case. In fact, I had fewer problems with him than I thought.

How complimentary was your problem definition with the client's?

The client liked the idea of open conversation and that it helped him to make known his problems.

What factors in your background contributed to the success of the scheme?

My undergraduate teaching as an architect was quite a classical answering in the sense; not to do Greek temples but to do contemporary

architecture. But it was very much the sense of that. It assumed that the architect knew more than the client and should do things which the client does not want him to do; that the architect is smarter and knew more what the client needed than the client himself. I left undergraduate school with that idea.

While I was a graduate, I had a very bad experience which included my being the leader of a revolt that tried to get a new professor to lead the graduate studies there, which was unsuccessful.

Nevertheless, the fellow whom I did not like was the major professor for graduate studies and had done some very nice houses for people and I found out through a third party that his method of doing houses was that he would come with a large pen and paper. He would sit with the client for two or three hours at the client's house and would make notes of their conversation. And when they ran out of time he would take his book away and would not do anything until the next time he saw the client. The whole process of p.d. and conceptual design took place with the client. Nothing is done without the client. Finally, when they had reached substantial agreement about an actual physical scheme for the house, then the architect would begin to do his work in his office without the client being there.

I thought that was a very ingenious way of doing things in many respects. And I think that affected my thinking to approach this process. I followed a considerably modified version of that with this client.

I think I have much the same skills as anyone who has been through

a good architecture school.

I think the most important things are things you don't learn at school because those things you learn at school are straight forward; learning to ask the right questions and to arrange a program for building and so forth.

You must learn about when a client says something what does he really mean. You have to make some interpretation of what the client is really saying and what I try to do is not make a wrong interpretation of what the client is saying. I immediately ask him a question to further clarify what he is saying. It is a skill you develop through talking to a lot of people.

A sense of what things cost. You develop the ability to talk about cost continuously and frankly. One learns by a bit of experience. Another thing is that when you learn progressively in school and after school you learn to work simultaneously with more elements at once, you learn to work with cost, site, role and aspirations of the project. With structure, space light materials, etc., you learn to push all of these things at the same time, not merely to work out a beautiful piece of architecture or sculpture.

What advantage do you have in working simultaneously with all these elements?

The advantages are that architectural projects have many components, structural sketches, light, etc. It is a fact though that only one of these factors can become a governing factor for the design. If you only work on one of them at a time, you may find later that

another of them may be a governing factor. So, you have to alternate all the work you have done before. It is very advantageous to be able to consider all the elements together, and to sense at each stage which of them will be a governing factor.

Please rank order those factors and give your reasons.

The two major factors are the site and money. These are the two things that cannot be changed substantially. So they became overriding criteria over anything else. The architect could change, the client's wishes could change, the amount of money he could spend was limited and the site, he has already bought. And so the budget and site became more important than anything else.

Do you teach problem definition? Do you teach p.d.?

I don't really teach it. I teach a building construction course. I teach bits and pieces of it. For example, when I teach building construction; why you might choose one system instead of another; why you would use concrete instead of steel. I am not sure how you are defining your p.d. You are in the seminar; we don't really teach about any problem. I also teach a design studio, but in that design, generally the way I teach it, I don't have the student define problems. The women I teach it with define the problem clearly in advance. We are not trying to teach that part of the design process in studio. Obviously, it has to be taught before the student gets out of school. I think it is extremely important, but it does get taught in other studios. I don't feel we have to. We try to teach other things. Nevertheless, the student will have to interpret the program we have

prepared for him in the studio. We don't quite prepare everything in tabular form with everything exactly done. We give the students what might be equivalent to an edited set of notes from the first several conversations with the client. Often the student must gather from that what the client's wishes are. He has to do some arithmetic, judge approximate sizes of things, judge appropriate relationships of things. We tell the students where the site is. They go learn about the site themselves and we also teach them about the zoning restrictions in all sites. They learn to become familiar enough with the building code.

By the way, one thing we left out of here is when I visited the town office we picked up the building code. The building code became an important document. These are constraints that one cannot generally work much with, although I did work out a couple of things with the building inspector.

RESPONDENT C

Please state the design problem. How did you go about defining the design problem? State, describe, map out the stages (taking note of events in chronological order) you carried out to define the problem from the very first contact with your client or even earlier if there was an earlier stage. Please be very specific.

This is a project for an elementary school in a city - X. It is called the T school. I first came into it when the community group asked me to be interviewed with some other architects. So that is the first contact I had with the problem.

The community group interviewed several architects. They were interviewing because there is a school scheduled to be built in that neighborhood. They had stopped the construction because they didn't like the plan. The school board was responsible for the design. So they have got some money and were challenged by the Board of Education - which is the board responsible for building it: "You had to find yourself an architect to work with him to redesign your school." The reason they came to me was that they had some promised \$4 million to build a school for 1,200 children. That had already been determined by studies of what the population was and...that was pretty much decided by the Board of Education in general. But they wanted to be involved. They interviewed me because I had done some work with communities before and interviewed other people for the same reason. They asked what experience we had in working with community groups, what kind of experience we had in doing, how we would work with them

and so on.

They chose my group of three people to be the architect for the preliminary design phase. So we started working with them. They got some money from the Federal Office of Education. We would be paid by the Board of Education. They were going to pay us to do preliminary plans.

The community got together to form a group to work with us. They spent some time working on that. We helped set it up. They got together some money and place to meet and a group called Charrette - the community Charrette. It involved five days of work and five evenings. In the daytime it involved small study groups - about 75 people and in the evening, about 300 people. There were about five work groups. These study groups were:

- educational philosophy
- educational facilities
- and community.

The people related memberships so that one group working on educational philosophy on Monday would become community groups another day. They were stepped up so that they could overlap. Each one of these groups would report every evening to a larger group - like a town meeting. So people who worked in the day came to receive reports, give their reactions and discuss the group for the next day.

The discussion for all the groups was to come up at the end, not with a plan but with a program. So that, the educational philosophy group would come up with some statement as to what the philosophy at

the school should be in its educational side so the output of that was a statement on what is to guide everything else.

The facility was to try to translate this into a rough program which meant not square footages but concepts of what kinds of spaces. Of course those two interlocked (in the sense that they wanted to have ...[not audible]).

They wanted a good library that would have free access to everybody so that both kids and community were integrated. The community facilities are expected to come up with a set of facilities which are open to communities of how they would be shared.

So again, there was a philosophy/attitude to what they should be. They were the things that were added that were not in the school - meeting rooms that could be converted into theatre. This however involved some extra cost which cannot be justified for an elementary school but a community center. So those three groups were interested in some way with which each group was coming up with statements. So this will be Friday evening at the end of the Charrette. This took one week.

At the end of that week there was a meeting with city officials, school board, agencies to make the presentation. We were away for one week. We came on another Saturday to meet with a much smaller group. That was with about 100 people.

What we did during the week was to make a program - 1) a space program; 2) a relationship diagram with that set. The space square footages, areas involved in the program and relationship of spaces

were known. Spaces involved were gym, library, classrooms, outside areas diagrams were done. We also prepared site analysis. We came to meet the people and broke into different groups working on the

- site analysis and areas
- another group on the relationships
- spaces outside.

Each of my colleagues took a group. What we did was go over what we have done; what our assumptions were and asked the people to help do it.

In the site plan analysis we brought in a huge site plan, all the houses surrounding it were sketched in. We brought in cut pieces of the baseball field and other facilities. Then we said, let's sit down and see how much space we have got; let's talk about the problems and that we have some knowledge and we told them our thoughts - main street, heavy traffic, noise, quiet side street. Then we just worked with people saying, how can we arrange these things in such a way as to fulfill the requirements of integrating with the community.

- We shuffled these pieces:

.... and so on.

tried to understand the logic behind every arrangement.

- each group makes its own modification
- redraft and integrate modifications to others.

We took another week and returned on Saturday with the first plan. We spent the week trying to put together alternative plans to fulfill the modified requirements. As they were modified and we started to do the plan, things which were obvious to us were not clear.

- We had a general idea that the school would have three stories.  
We did this from a simple calculation.

It was now obvious that we cannot put everything the community wants for access on the ground floor. We had to put some of them on the other floors. And the choice was which do you choose on the second floor. So we made some assumptions and said that the community has expressed interest in science and should put science on the ground and art things on the second floor. We made some other choices and began to put things in various places on the site and came up with the real first preliminary plan. We built a very simple take-apart model from the preliminary plan. It was quite good for us and the community.

We discovered a lot of things in working in this process. We usually make a lot of assumptions as architects. And by having to explain to a layman, it really cleared up our own heads.

We went back to there again on another Saturday, met again, this time in one group to explain the plan. We made the presentation, explained our assumptions, explained carefully our questions that we did not know. We got a response. A discussion revolved around that. They felt that the gym and the pool were in the right place. The play field worked a good compromise. It was a very good client group as they really understood. Then they provoked the questions:

- should the library be on the second floor?
- should the art be on the second floor and the science on the ground floor?

These discussions were then followed by what do we mean by a library?

Who will use it most? What kind of science program? What kinds of equipment do you have? Do you set up projects? Which of our community people will be interested in science? Which one is interested in arts, which one is interested in the library?

A whole set of discussion was by:

- 1) questioning
- 2) comparing

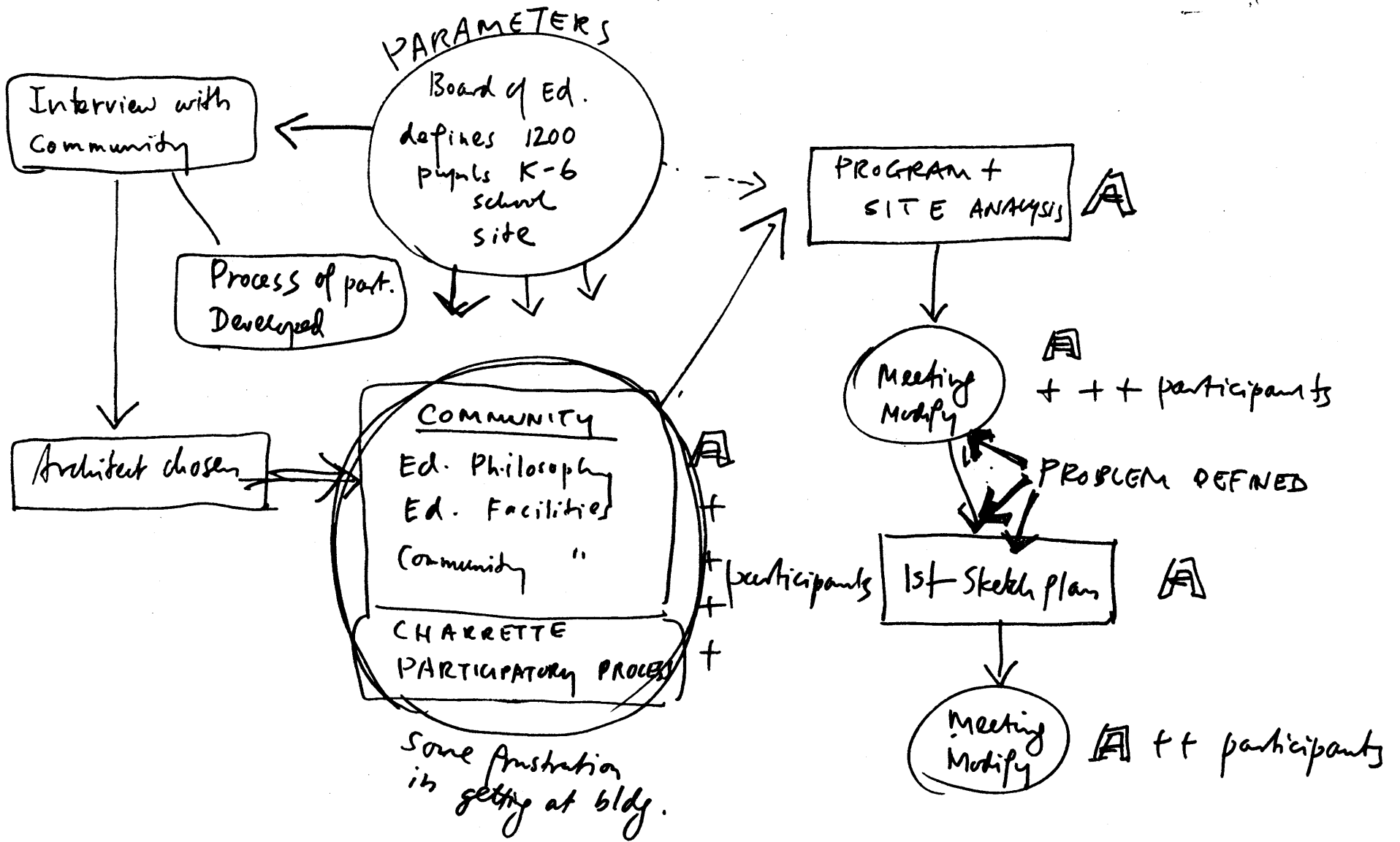
We went back for one more week:

...or what is in essence a preliminary plan which corresponded to the requirements of the Board of Education's budget plan. From that they made the cost estimate and for compliance with building codes, educational requirements. We had done in four weeks what used to take four weeks without community participation. This preliminary plan went through review and it took six months.

After six months, they recommended some minor changes which were to be changed.

The budget process took three years where nothing happened again because the school board didn't like the community doing this much work so any change they have got they sort of knock off something from the budget. Finally in three years they made the budget cutting.

After three years, a new group of people were asked - myself, the people that worked in my office, plus one new person met with the community again. At this time, they have got some very rigid set of requirements from the Board of Education. We approach this phase with an open mind and see what type of changes we ought to make.



○ Process

□ Architect's work

Board of Education

Community groups

Community Charrette

1200 children

Friday eve.  
~~after school~~  
at end of  
Charrette

5 days of work 75

5 evening 300  
town meeting

Study groups:

Educational philosophy  
" Facilities

Community "

Rotating memberships

Statement on  
Educational philosophy

Rough program  
what kinds of spaces

what facilities  
you do want  
how shared

T. Lee et al

Architects  
interviews

2 or 3 months

1 wk.

Meeting with  
city officials,  
Bd. of Ed. members,  
agencies

1 wk.

Sat.

1 wk.

Sat.

1 wk.

Sat.

Space program areas

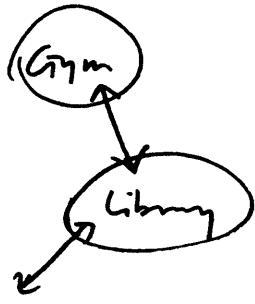
Meet with 100 people

Make plans

1st plans

Problem plans.

Relationship diagram



1. Side plan  
play fields  
open space

2. Relationships

3. Spaces

Outside areas

Site analysis

Budget plan

Cost estimate

Compliance with  
bldg. codes

other requirements

Preliminary plan

6 months →

public inty.

1 month → 1 month

Changes due to

bureaucracy

revisions

major changes

3 years

Budget

Put out

regulations

6 months

Bureaucratic practices

MAJOR DECISIONS

1 year of working drawings & specs

minor

+ continuous changes

3 months

under cost,

- They knocked off the pool as there was a pool in the neighborhood.

- Some more regulations were put on the classroom design.

After three years we first held a public meeting, went back and did some of these changes and a series of meetings - once a month. In these meetings we talked about materials to be used within the context of the changes that have been made. In these meetings major decisions were made.

A year of working drawings, minor but continuous changes were made. At this point the community was involved minimally. We had reviews, some in four months, six months, etc.

That is essentially a not atypical process but on which I was very involved with which I think in many ways is a good model.

In which points in time did you feel a sense of frustration? Why?

How did you overcome it?

I was never really frustrated in this process. The frustration came later when I had to deal with the bureaucracy. The whole process here was very frustrating. Working with the community was not frustrating; it was difficult but I enjoyed it. Dealing with the bureaucracy was frustrating because I could not do anything but fight with them.

Working with the community was exhilarating. Here I felt I was not working enough so I worked harder to get at it. But that was more or less continuous. If we define frustration very broadly, there were some frustrations in trying to get people to talk about the building. Some people wanted to talk about process while I wanted to talk about

the building. If there was some frustration, it was getting the people to talk about the building.

You said you worked hard. What did you mean by work hard?

It is not obvious. It is not like the bureaucrat who gives a program with spaces specified in area. For example, in this the people expressed the need for a sense of participation in the classroom - a one-to-one participation with the teacher. Then the question is, how do we translate that same point into an environment that would accommodate that? We would like the community to have access to it, that is, closer than we can begin to say. We shall open a door at this point so that you don't have to go through the school to get at the part. We place it at the edge of the building so you can get to it without opening up the whole school. Other schools are designed so that you have to go through the school to get to the gym, art room, etc.

So the hard work is to try to extract from the people such information.

At which points in time did you feel a sense of accomplishment? Why?

At each point there was a sense of accomplishment. At the end of the first week, there was a real sense of accomplishment that we have actually involved a lot of people, talked about it in a good of actually come up with some recommendations. And at the end of the first week to be able to translate that into a program and have people react to it in a positive way. Each step in each week, there was a moment of accomplishment. Finally to reach the end to have a school designed which the people really supported to have a sense of what school is

really like. It was a tremendous sense of accomplishment because we had broken through many layers - professional barriers. I always like to think that these people are the best clients that I have ever had because they really asked me very penetrating questions. As a result, I understood what I was trying to do better than most professionals. As a general remark - what factors (activities, stages, indicators, skills) do you think influenced your effectiveness most in defining the design problem? Please rank order and give your reasons.

The first process - the Charrette.

1) The ability to listen is most important. You really have to hear people and try to understand what they are really saying. The ability to ask them questions - in short the ability to dialogue.

2) Programming skill: ability to take things and change them. Ability to take non physical things and put them in physical framework. It's the architect's most important skill.

3) Synthesis of the program: Synthesis of the program to relationships and philosophies into a multienvironment (synthesis of all environmental factors to the building).

4) Ability to feedback, dialogue some more.

Do you teach problem definition? How do you teach it?

I don't think I have really tried to teach it.

I think I do by implication. I expose the students to the process by making them stimulated to do it. The fact is I don't teach architectural design. If I were I would sit down and think about it. I teach it in a more complex scale to design an area instead of a build-

ing. It is still the same thing. How do you find out what is there. Environmental design is partly talking to people about....you have a program: which takes many different forms in the way and each is trying to dispose them to actually doing it.

In the other course I teach, I break the process up. I don't give everybody the whole process. I think it is fairly complex and something you learn after a while. What I do is take off the programming process altogether and just concentrate on the synthesis part. I tell the student what the program is and I substitute the client.

I think the problem with design teaching is that they try to teach too many things at the same time. This is a process done in 2 to 4 weeks by people with experience. I don't know how I will teach it because I have not thought about it. I will like to do something I think on the level of the student. I will expose him to a whole range of these things. Reduce the problem to simplicity. You really reduce the level of complexity as much as possible.

RESPONDENT D

What is the design problem?

This particular project was a competition. It was a two-week competition. One problem as I stated it was to design 8,200 units of elderly housing and they gave us very precise requirements:

- How many units?
- What size should the units be?
- Standards and so on.

Now in terms of determining what the problem is -- I am not sure this fits into what you want but I will try.

How did you go about defining the design problem? State, describe and map out the stages (taking note of the events in chronological order) you carried out to define the problem from the first contact with your client or even earlier if there was an earlier stage. Please be very specific.

The definition of the problem to me in this case is not designing something physical at first; it is just a belief that I have, that too many architects, historically have taken the program from somebody and then designed it without thinking about the program, and consequently that is why architecture to me is a rich person's profession. Because you cannot have an architect without having money, you don't have kings without dictators.

It seems to me that the first problem is to ask yourself:

- why are you designing or building some housing?

So, the first thing we did was ask:

- What would it be like to be an old person if you are designing a house for the elderly?
- What are their problems?
- What are their concerns?

What we tried to do in a very short time (we only had a day to do this) was to define the problem.

The subject mapping out his process:

Say this is the thing that is given to you. Let us call it the program. And this is made up of government or economic structure. There are a number of things that make it up. Now, historically the architect just takes it and does not question it and then starts to make pretty pictures or designs. What I am saying is that for me at this point, the architect has a responsibility in a political and social way to go back and question this.

For example, if the mayor of Boston says, "you have got to make 100 units of housing on a piece of land" -- I think it is the architect's job to say to the Mayor: "I don't think there should be 100 elderly people lumped together, or I don't think that site is appropriate."

I don't think this happens enough. The architect is just anxious to get a job. The architect never stops to consider his impact on people and landscapes. Consequently, that is one of the reasons we have a very lousy environment. Because the architect, historically, has been hiding behind some poetic and artistic license. Basically, he is just a pencil for the mayor.

So what we did here was: they said 100 units of elderly housing and we said, "well, what will it mean to be an elderly person? How much will you want to live?"

We read what we could about elderly persons. We did what research we could.

What type of research did you do?

The nearest kind of research, consulted statistics on elderly. The valuable part of this is that we worked with a consultant. That was helpful. But I don't have much belief in research stuff per se. I rely more on my intuitive observations and what it seems from my own experiences. And what it seemed to us was that elderly people are probably the most particular in terms of their desire for living than any other group; that the elderly, like all isolated groups that receive attention, gets very generalized. Right now a lot of money is being spent on elderly studies. The results of that money says most elderly people are over the hill. They cannot see any more, they cannot lift their feet up. They want to be left alone. Now sure, I agree that some of that is the case but it seems that there is a lot of elderly people who don't fit that description and as soon as you make generalizations about any group of people you are in trouble. You have to ask about them as individuals.

So we redefined the program: They told us that there's got to be 80 units of housing which was approximated to 480 square feet. We said that was nonsense. We said there has to be a range of units which might range from 750 square feet to 700 square feet because

elderly people like anybody else, do not like to think that they are all the same and might have different needs and choices. So we changed the program. Instead of designing for one unit type, we designed for a dozen unit types. To me if we didn't stop to look at the problem in terms of the program so that later you can look at your design, I think you are wasting your time. It is just like making a linear process between what the mayor tells you to do and when you start your designing. So that is the beginning of the problem to me. i.e., redefining the problem, questioning the problem, and I think you have got to question all areas - socially, politically, economically.

You should be careful that what you are designing is not making a political statement you may not agree with as it gets very easy to do. So that's one part of it.

Please clarify your cliental system:

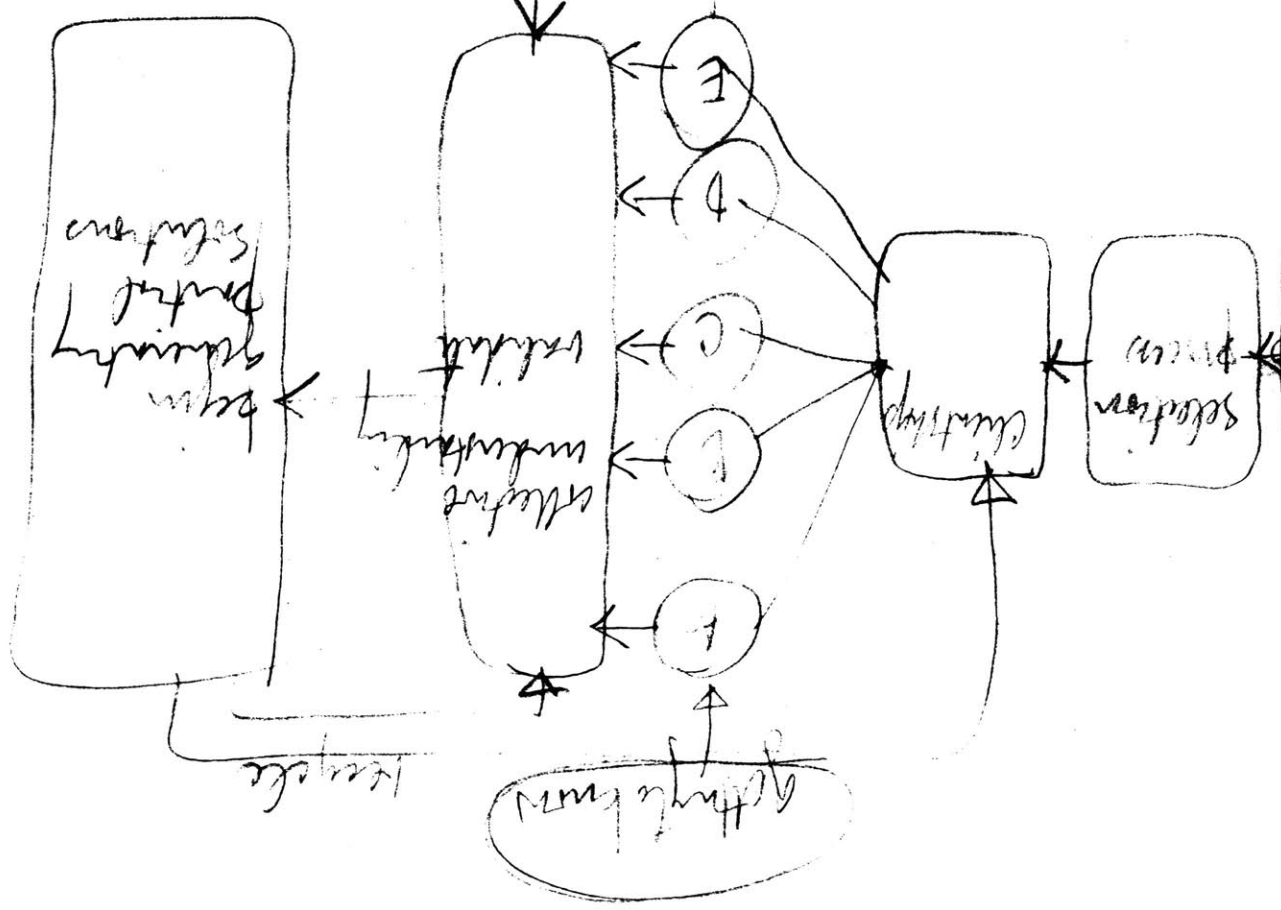
In this project, there is no client. The client is a piece of paper. We don't know the people we are designing for. If you don't know the people you are designing for you have got to design open ended systems and not design rigid situations. If you know the precise people then it will be a different thing. There are many cases where the architects are working and do not know the people they're working for.

How long did it take you to redefine the problem?

It took me only a day as it was a two-week competition. Nevertheless, I think in a day you can flush out a lot of information.

performance objectives

n



How and when did you know that you had defined the problem? What clues did you use?

I do not believe you can ever define a problem. I think it is a constant process of changing, layering it, where you make assumptions, you say that all the people in this case are not the same. That was defining the problem. Whereas the program said all elderly were the same. So you make some assumptions based on your intuitive observations, what your grandparents were like and the people you seen around you and what they are like. But you must test that. We have not tested it yet. We will test it. In the testing process we may find out that our assumption processes were wrong. But I don't believe in getting all the facts together first and then making some great logical decision or conclusion. I think it will even sit there. I think you have to come to it with some kind of point of view and test that and continue to test and be quite willing to say, well, it was wrong and start all over again. I think that is the other problem. That is, maybe architects try to think too logically.

And I am saying that it is more of a circular device where you constantly are able and willing to throw away all you've done before and start all over again.

What were your primary considerations while defining the problem?

These primary concerns were more human than physical. They were certainly some concerns that we had in defining the problem as related to the land we were building on. In the sense that we didn't want to mock up the piece of land. I guess that more of the concerns were

related to the people who would live there.

Can you be more specific about those concerns you had?

The obvious simple ones, the people as individuals and not as a group.

At which point in time did you feel a sense of frustration? What is the nature of this frustration? Why? How did you overcome it?

All the time. First I don't believe in dealing with hard kind of facts and information, as they wanted me to lead anywhere. Therefore, in this process of redefining the program you are dealing more with intangible thoughts. And any time you are dealing with intangible thoughts then there are always questions. What you have to say is as much as you think can be said. It's like writing a poem. If you are writing a poem, at least if I write anything, I can spend a year on one sentence because it is never complete - as good as you think it could be. It is a constant process of redefining it.

Well, I don't believe in what Corbusier said - "Creation is a patient search." I think creation is hard. It's hard work and the whole process is frustrating.

How do you overcome your sense of frustration?

Hard work. I don't think you overcome frustration. Whenever you get frustrated, that is the time you better start working harder.

What do you mean by hard work?

I mean sometimes the process of design, making a decision about that something doesn't work, the tendency is to walk away from it or your tendency is to forget about it. But I think that is the time you

really have to spend all night thinking about the problem. But I think what is most exciting to me is that whenever a problem comes to me in terms of design process, you have an idea and all of a sudden from nowhere something happens and the idea does not work. At first you think -- my god, it is a real problem. But after you have worked with this (I have never done anything where the final ideas resolve this thing -- has been a lot better than when I started) I am not saying it is easy to get from here to there.

At which points in time did you feel a sense of accomplishment? Why?

I cannot define any part of time that I felt a sense of accomplishment. I think the feeling of a sense of accomplishment on a graph is like this (a rising graph). I can only feel a sense of accomplishment only when the project has been built and when people in it say they enjoy living in it. It is only then I will feel good.

As a general remark, what factors (activities, stages, indicators, skills) do you think influences your effectiveness most in defining the problem? Please rank order and give your reasons.

It is hard for me to define any one skill. Perhaps the skill of intuitive observation. Or the skill of being able to take what your life has been all about and understanding your past and trying to relate that to other people's lives. I don't think this is a skill but I think that's what it is. If you don't know how to draw designs, you are in trouble. I cannot rank order them. They are in one big bag.

Do you teach problem definition? How do you teach it?

I set up a process and one thing I try to teach is how to approach

a problem. So we go through a series of steps.

The first step: If you are building something, you are building something somewhere and that is either a piece of land or a building. You have got to know what that piece of land is. So I try to give them a series of exercises and encourage them to know the piece of land not in a scientific way only; that is important too.

I try to ask them to look at the land in a sensitive way. I encourage people who have a piece of land to go out one weekend and picnic or party on it.

I try to tell them that before you design something on a piece of land you have got to know that piece of land as you know your backyard at home. Or if we are architects each time designing construction detail have to constantly measure it 2 by 4 to know the exact dimensions of it we will never get anywhere.

The second part is taking the program which I give them. But I ask them to step back and think about that program. Ask them to think about how they relate to that and ask them to write an attitude or develop an attitude which I find most people don't have. They have but don't surface. So that trying to get them to release their personal experiences and part of their lives from the problem and if you can get that out in the open, then maybe they will be able to be open to the people's problem.

Then I ask them to quickly from that and the land and the attitude and program. The attitude is like the poetic part of it and the program is the prose part of it. I ask to do some schematic or conceptual

ideas. The real purpose of that I think, you always come in with something of a preconceived idea which is wrong. You try to flush that out and get it down on paper so that you can look at it. I believe strongly that if you do that early and then out of that will grow something which is not any one of these ideas but can be one. But I also tell them at the same time that this process we teach is linear because of the academic order and structure of the environment, but that I really believe it is circular and that there is a constant feedback to the situation. So you are doing it step by step. But in reality when you get your concept done you ought to go back to the program and see whether you might make some changes.

Though there is a series of steps -- that time is the time which maybe you may want to do some research. You take what you got, you go and look at everything that you have done and compare with what you are doing. That is the time you go back to the site and you never have seen a piece of land really until you see that piece of land in relation to what you have been doing. All of a sudden you see it in a new light for the first time. If any research is done, it is done here and not before, but after, you have done something to test it against. So you can see what you are doing as against what somebody else has done.

Then I try to make them change the scale, say if you were working at 1/40 inch scale then I try to say you work a 1/14 inch. I think your mind has to think in all scales all the time.

It is just a continuous back and forward process. I try also to

expose students to all kinds of outside things. People who come in and have things to say. I guess in a way to confuse the people. But that is to see that there are other layers of stuff that we have not been talking about.

RESPONDENT E

We did a series of projects for the central area of a city. Some of the houses have been built and others are waiting to be built.

What is the design problem?

Let me say my view of the working process is: that you only have some hunches of the problem from the start. That in fact your doing the design helps to both define what the problem is and define what the solution is and they evolve concurrently through my process.

And that is for a lot of reasons. Somewhere from the onset, the problem turns out not to be the problem. Other things turn out to be important. For example, from the onset if you tackle the problem to fit a building into a tight site you may find later that that is not the problem anymore. One has to always have a revolving sense of the problems you are trying to solve and what the solutions to the problems are. The two should be pushed simultaneously. In this case's situation, the problem as we were presented with it was complex. But there were several pieces to it. One was that the downtown of the city area has been declining and having exodus of stores. One part of it was an economic problem. It had several branches to it. There were questions as to whether its future role would be in economic times whether they could regain the status it once had with metropolitan area. There were logical questions as to what is the best strategy to get specific kinds of things into the area.

The second one was that the city had in part before we came to undertake a lot of action. It cleared three sites of the downtown and

was planning to clear the fourth. There was an enormous amount of land existing idle in the center of the city. Something like 148 acres cleared. The city center was ringed by five blocks of vacant land on all sides. And so that was a question of what should they do with that? Should they use that for the new facilities or not?

There was a third set of problems which were specific kinds of needs. There were a number of things proposed; the city government center, parking structure, etc. The question is where they should be put? Where will they have the maximum impact. There was another piece of the question which was how can we improve this place so as to make it more attractive, more convenient. Both in terms of having an impact on the economic situation and also to make a better place.

Finally, there was a problem which was a very specific one which we were posed. Should we close the main street to traffic to make it a pedestrian walk.

These were some of the things which were posed as problems from the onset. As we went on there became other sets of problems. Was it more important to develop the land or to keep a compact core? There were issues of what the impact would be.

There were all kinds of issues about the government center as to whether it should be one set of facilities, should be on small or large sites.

As we went through the process there were logistical issues and how to accomplish whatever we wanted to do which began to enlarge and we began to see some solutions.

My point is that it is like an architectural problem that there is never one problem that you are trying to define or one definition of what the problem is. What you have is a series of hunches from the onset. Some of these get solved, some of them get waylaid. Some become less important. Some become more important. A series of the things get laid in.

What one has to deal with is a revolving definition of the problem you are working on as you go through it.

How did you go about defining the design problem? State, describe and map out the stages (taking note of events in chronological order) you carried out to define the problem from the very first contact with your client or even earlier if there was an earlier stage. Please be very specific.

Again I have to depart slightly. First of all it is never clear who the client is. Somebody is paying the bills, but that somebody may/may not be the people that project may have an impact on. So one of the things to do is to come to a better sense of the clientship of the project. That is, you have to ask yourself who will be impacted by the changes here.

You have to begin to broaden your sense of who the client is. In this case our bills are being paid by the city planning commission, and partly by the downtown businessmen. They were certainly not the only people to be impacted by our solutions. The first thing is to build a pattern of the clientship. The second thing is that the person that hired you very seldom has a good sense of the reason they hired

you. Moreover, even if they have a good sense they may tell you all the reasons why they hired you.

My question has always been when a person hires an architect to do some work, they are hired because a lot of people have agreed something needs to be done but may not be agreeing on what needs to be done. So what one has to do is to meet each of those significant clients and understand what their perception of the problem is. That is the first step.

One guy is going to say the problem is X and the next guy will say it is Z. So you have here several perceptions of the same problem. Then the question you have got to ask yourself is what is the problem? It is both of those things or is it not? Is one misguided? Is one right? or are they both right?

That is the way I think one has to wade through that process. Then you begin to make some judgment about operational definition of what you are trying to work on. What you may decide is that they are both right or sometimes even when they seem to be conflicting, you still decide that they are both right.

- Make a long list of what people have said about the problem and ask who said it?
- Sort through that and try to see whether there are a few things it solved, you could have impact on the solution of clients.
- Thus, the first step is to find the right entry point into the situation.
- You can never collect enough information to make sure.

- People are always working in situations where they don't have enough information to make decisions.
- The problem is that information is costly too. One always has to balance out is that by getting that initial information at a cost that might likely impact the thing I am doing so that I get at least that amount of value of it.
- You begin to make judgments about (i) what the set of problems are that you are dealing with, (ii) what you need to know to be confident with each of those, and (iii) what the cost of the thing you need to be confident about. Now the thing I should say is what I have been talking about here is
- the model assumed here about the designer is as a neutral agent who is a technician who takes other people's problems and tries to solve them. In fact, the designer has his own set of agenda which he will like to see happen in a situation. He ought to be open about that and one way you can think about the process of solving problems of a building/environment is that when the client selects who he wants to work for him, he also selects what kind of solution he wants. That is a deliberate process and not granted as accidental. And so by voicing one sense of what kinds of places he will like to make as a professional a way that the process by which he has a client interview him and lots of others, will help the client understand what problem he would want solved too. And so it is really a convergence on what kind of stuff you are building into it, the agenda that you

have for it, (the prof has to be open about them) and on the other, the agenda others are bringing to you and so action process.

Please map out your problem definition process.

The question is when do you cut off the recycling process?

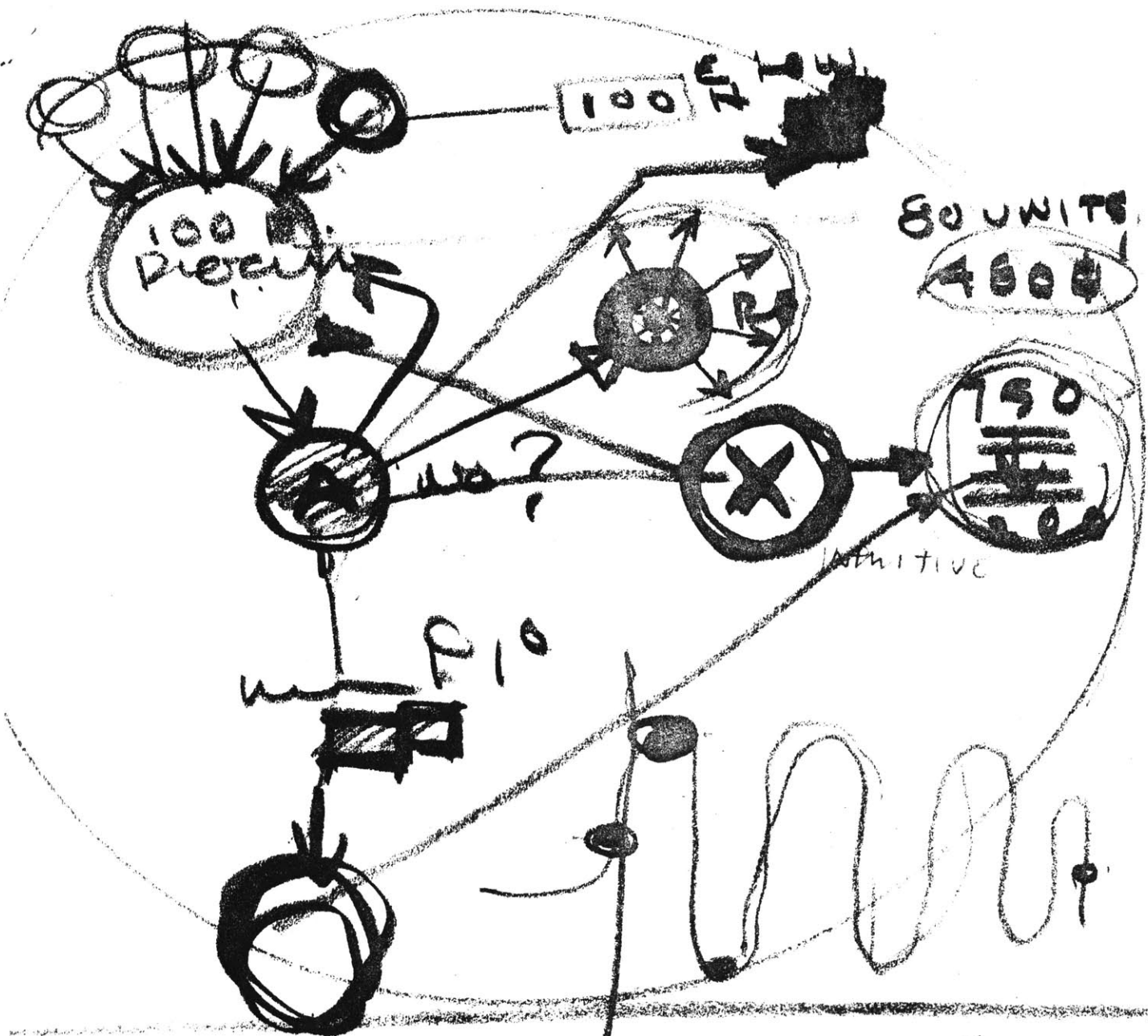
1) You stop when you run out of budget.

2) When everybody including you is satisfied enough that the solution is all encompassing and that they are willing to take some action. As a result, they are committed to spend their energy on it. So where you stop has something to do with psychological state of mind and also some practical economic things.

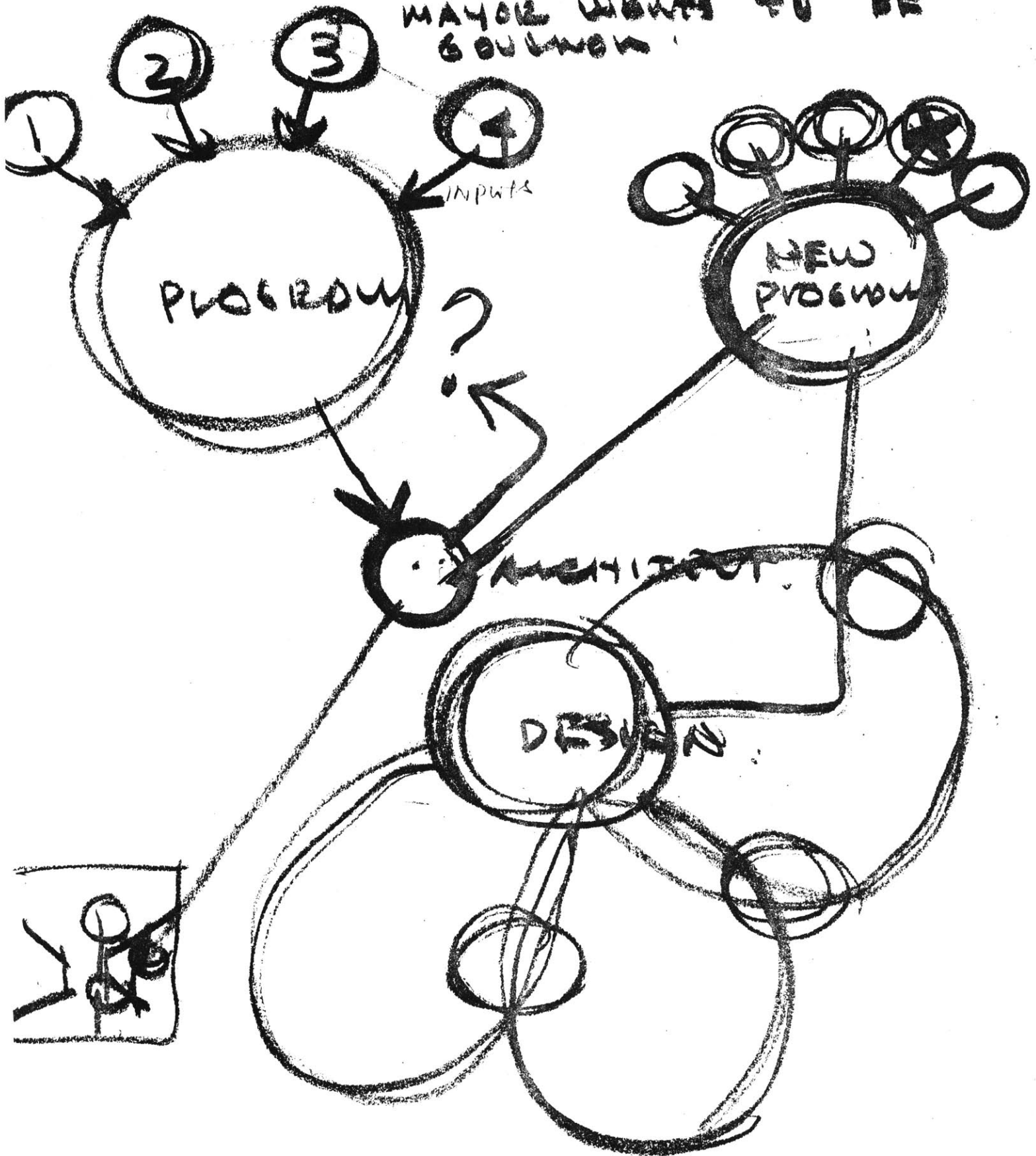
It may also be determined by the fact that you have to have something down the line and therefore you have a finite piece of time.

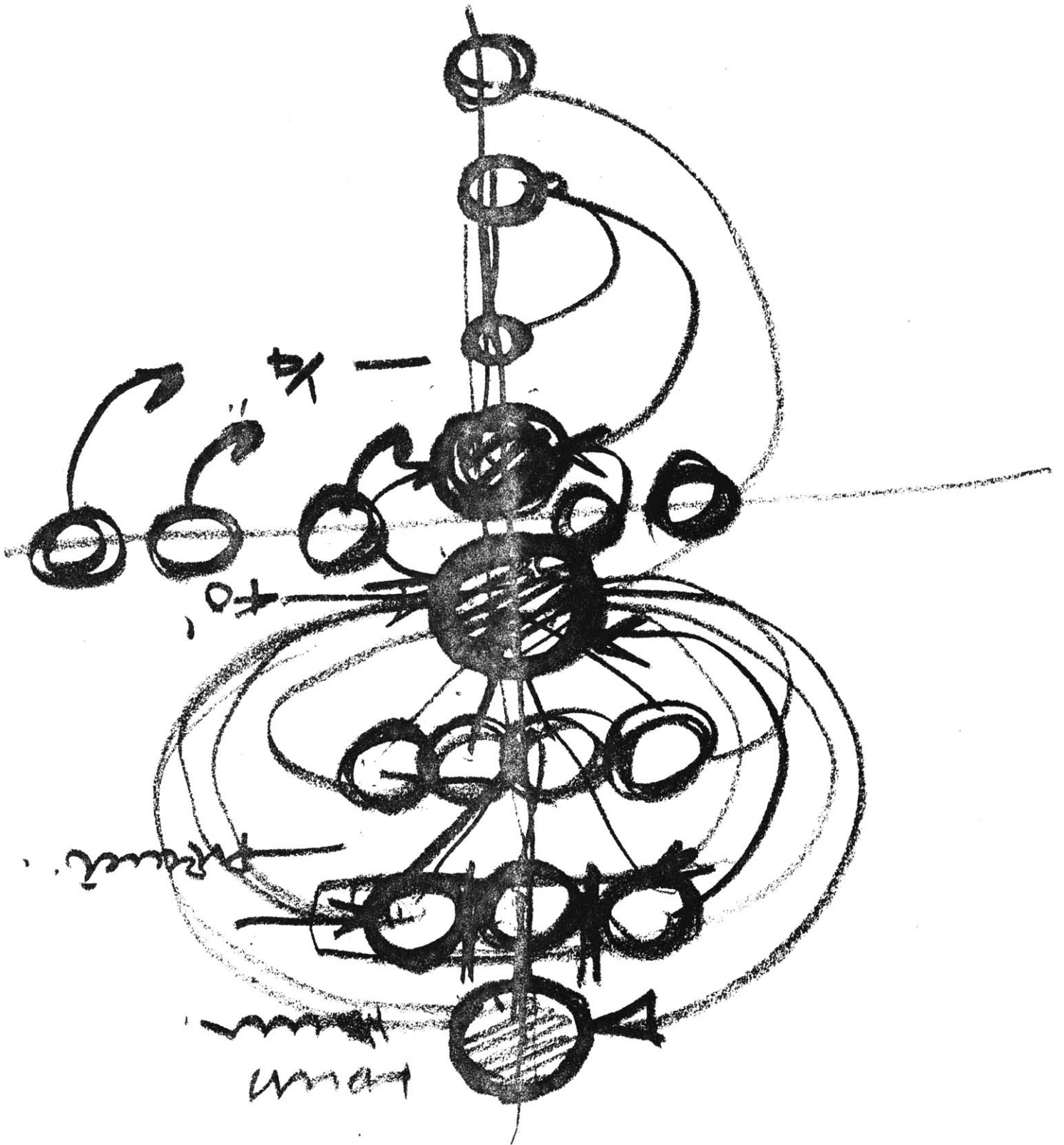
Please further elaborate on your clients' attitudes/behaviors towards you.

In this area, several things. First the people were skeptical that anything would happen about change. It is interesting that people have suggested a model of problem solving; that of process that is you say there are alternatives A, B, C, D, and E or do nothing and another alternative. And they have said that now, all is set and the problem is to find the right way to choose the right solution. Other problems with that argument are that doing nothing is usually an immensely easier track than doing something. If you decide to do something, what do you do? Harder to get particular ideas up to the point where one even viable for doing nothing, the professional



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cannot be in a dispassionate position. That is you can't step back and say now, here are my drawings, all these kinds of things. You either do that or you can do nothing. You can't work that way. Skepticisms more than anything would happen.

Secondly, is that you are put in a position to advocate solutions for anything to happen. And so one of the issues that is involved here and that is often involved in your interaction with these people is that they are never neutral.

What you are saying is, look; from my collective understanding of all of the things you have said, that there's the kind of solution that would be good for you here and in fact you have to make the agreement for the solution. Tell them what the negative consequences are but you have to in fact advocate before you can expect anything to happen. Because in a role design situation, at least, it is a lot easier to do nothing than to do something.

The second is that well I will be surprised by that. In fact, you become a salesman of the things you are dealing with.

Moreover, you are in a position where you have to limit the world and say I think this is the set of problems that from all I have seen are more crucial to work with. This will create some because what others think is their most important problem is not what you see as the problem and have to begin to reconcile that.

Is there anything you think you have left out of what you say?

Oh yes. Sometimes you only know a problem from what comes out of the solution. That your understanding of the problem comes only after

the solution. In some cases you can know beforehand what you want to solve and the solution only tells you whether you were right or wrong about the problem.

The implications when you deal with something as a problem setting process, there is some kind of a linear relationship where you set a problem and how you go about solving it. It is also true of research. You can only go retrospectively and not prospectively.

In which points in time did you feel a sense of frustration? What is the nature of this frustration? Why? How did you overcome it?

There are all kinds of frustrations you are involved with:

- Some of them are personal and deal with whether you can do it or not.
- Some of them are collective.
- Related to difficulties at getting together people who have their own agenda that they are working on.
- Some deal with the staff you are working with.

There are different strategies you can use:

- You continue to lay the frustration on the table and not let them get aside. You get the people together and let them know what you are frustrated about. That is, to let your notions be felt.
- In some cases you let things ride for a while or cool off for a while.
- Sometimes you use hard work and find a way around something.

At what point in time did you feel a sense of accomplishment? What is the nature of this accomplishment? Why?

Some during the process. The fact that you have designed a piece of it, accepted or agreed upon.

For projects that take a long period to get built, one often loses that sense of reinforcement. This is where the recycle process could be of use. Coping within that, for example, what you do is try to identify some early actions taken that will put some stuff on the ground that you can see.

What factors in your background have influenced your problem definition process?

I have done some projects where I committed myself to a lot of inquiry at the onset and then find that I was doing stuff for reasons that later evaporated and were caught up in the production of something that did not have meaning later. It made me a lot more cautious about committing all my resources to a simple stream of activity. It made me much more interested in cyclical ways in which we do one pass at it and then find out what you have to go and try a larger pass through that one thing.

Another is the frustration of being caught in things which have run out of their own stream and where everyone has lost interest in it. That is the reason why I emphasize doing a careful search. I have had a lot of experience doing certain things for some clients and after finishing it find out it's only part of large system. If you had been aware that you were doing the same thing with other people you probably

have come to some other kind of solution.

I have been involved in all forms of problem solving techniques when I was an undergraduate architecture student.

One thing that has been influential to me is the whole notion of Baysean decision theory which is to constantly ask yourself what it takes to make me change my mind about something. To put cost on what it will take, the cost of likely error of not doing the solution that may be different for what it will be, to make some judgment about whether it's worth doing some more information gathering.

As a general remark, what factors (activities, stages, indicators) do you think influenced your effectiveness most in defining the design problem? Please rank order and give reasons.

I think one is architecture skills. Being able to draw out of people what the issues are. I rank that high.

The skill to be able to do a synthesis of things. To be able to take a list things people have said were important and able to sort them up into categories, hypothesize and make into detractable units.

The skill of being able to make inferences to on the spot design-  
ing of things. Because often when you are dealing with someone, he says, "we don't have any place downtown during lunch hours". To know what he means by that we have to question him. Tied to this ability to draw a precedence to draw out people ideas you are talking with them. That is a consultative skill. It is a critical one. It often means you doing inventions.

Another skill is to be able to cope with uncertainty. You must

be able to not only cope with it, you must be able to cope with it creatively. I found that writing skills are terribly important. Graphics could also be used equally as well too. Writing ones are somehow more reliable. Being able to force yourself to write down something does two things for you. To do it in the first place you must have thought about it. Secondly you will be able to give it to somebody and say is this what you mean. That is rather a critical piece.

Do you teach problem definition? How do you teach it?

We do it roughly similar to this process here. For example, we are doing a project in Roxbury this semester.

What we are doing there is a process in which we had the class break into nine groups and have each of them go to one particular client group and talk about what their wishes were and how they might see that area, the problem of that area, the opportunities of that area.

We then have each of them make a synthesis of their sketch problem where all try to put all of them together. I guess that is what I am saying about cyclic process. We put all together in one place. We will trace back, have them work in groups, go back there, have sense of clientship, what ideas should be incorporated, what the problem is, produce a solution for it. We then have them individually for a small piece of that later we are designing a part of it.

So it is recycling it. It involves the business of writing down your perceptions and communicating to others a piece of the problem. Again, trying together problem and solutions and not try to separate

both. In our asking them to talk about clients you are asking them to talk about group clients we asked to say what the problem of those clients are and solutions also.

We don't know whether we are going to use and how we are going to use. We are trying to push both of them. We are not trying to get a clear and abstract problem definition before we begin to do some synthetic work.

RESPONDENT F

State your design problem.

This project was to investigate and then put together classroom materials on an environmental management process and it was for coastal zone management in California. My particular problem then was in a couple of parts:

- the first was to understand the entire process myself personally.
- the second part was to evaluate the process.
- the third was to communicate that process to a group of people.

How did you go about defining the design problem? State, describe, and map out the stages (taking note of events in chronological order) that you carried out to define the problem from the very first contact with your client or even earlier if there was an earlier stage. Please be very specific.

The design problem in this case was three-fold (as above). I should really say there are types of design problems. There was the problem of designing the entire project. And I designed it myself: by that I mean how I was going to go about the project, who I was going to contact, what was important. The real physical part of it was preparing the case material that would be used by the class, or say, the preparation of the case book. Also, preparation of the course slide papers - this was really a design process. How I went about defining the design problem is very difficult to say. I think it was very similar to B.S. talked about in class. I started with having little information about the problem. But, as I went on, I began to

to see more of the things I thought were important. Then, I went to California. I interviewed people and made a lot of slides. The problem then began to define itself. In other words, at first I made an input in to the problem and later the problem began to input to me.

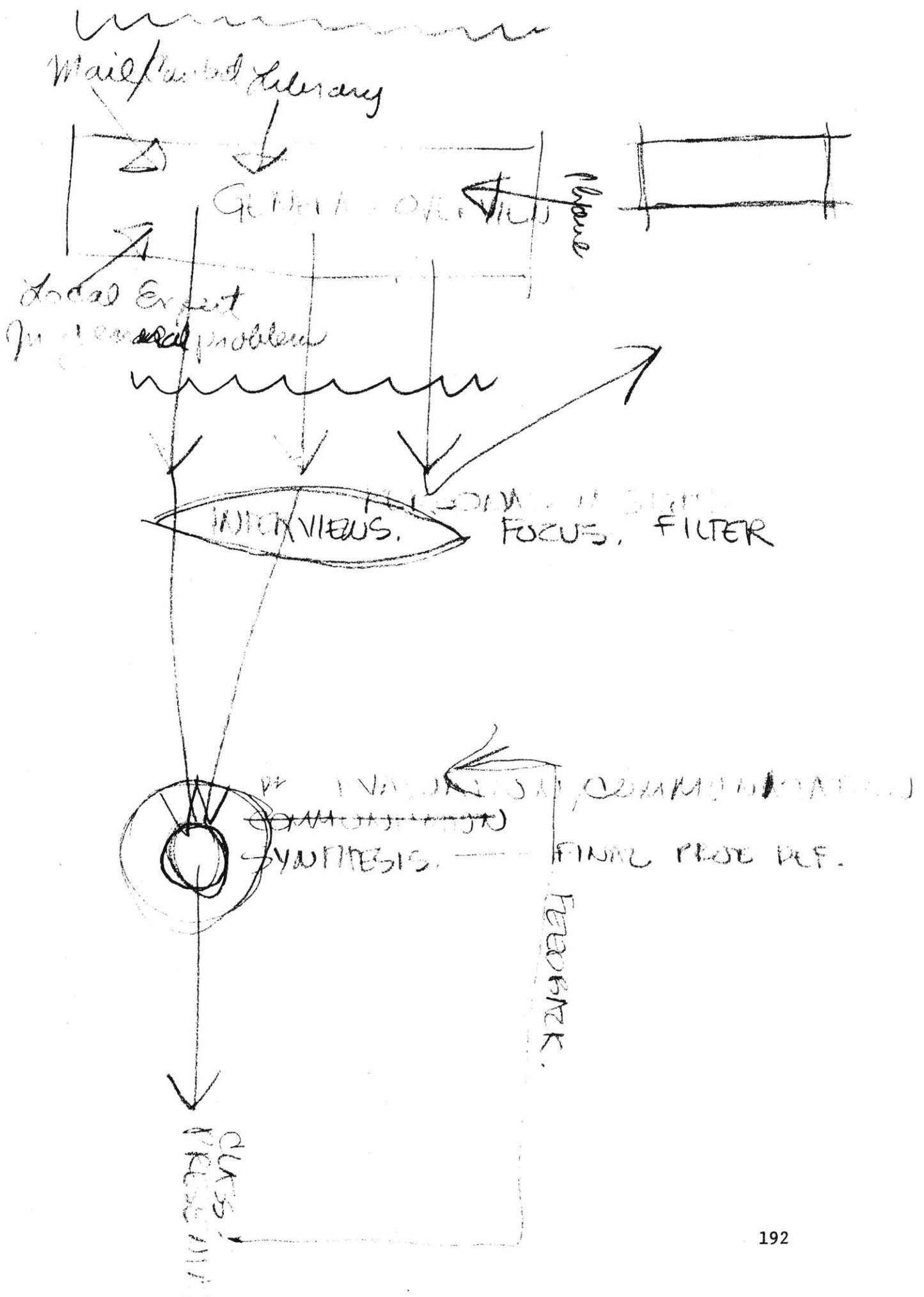
Please, elaborate more on your process.

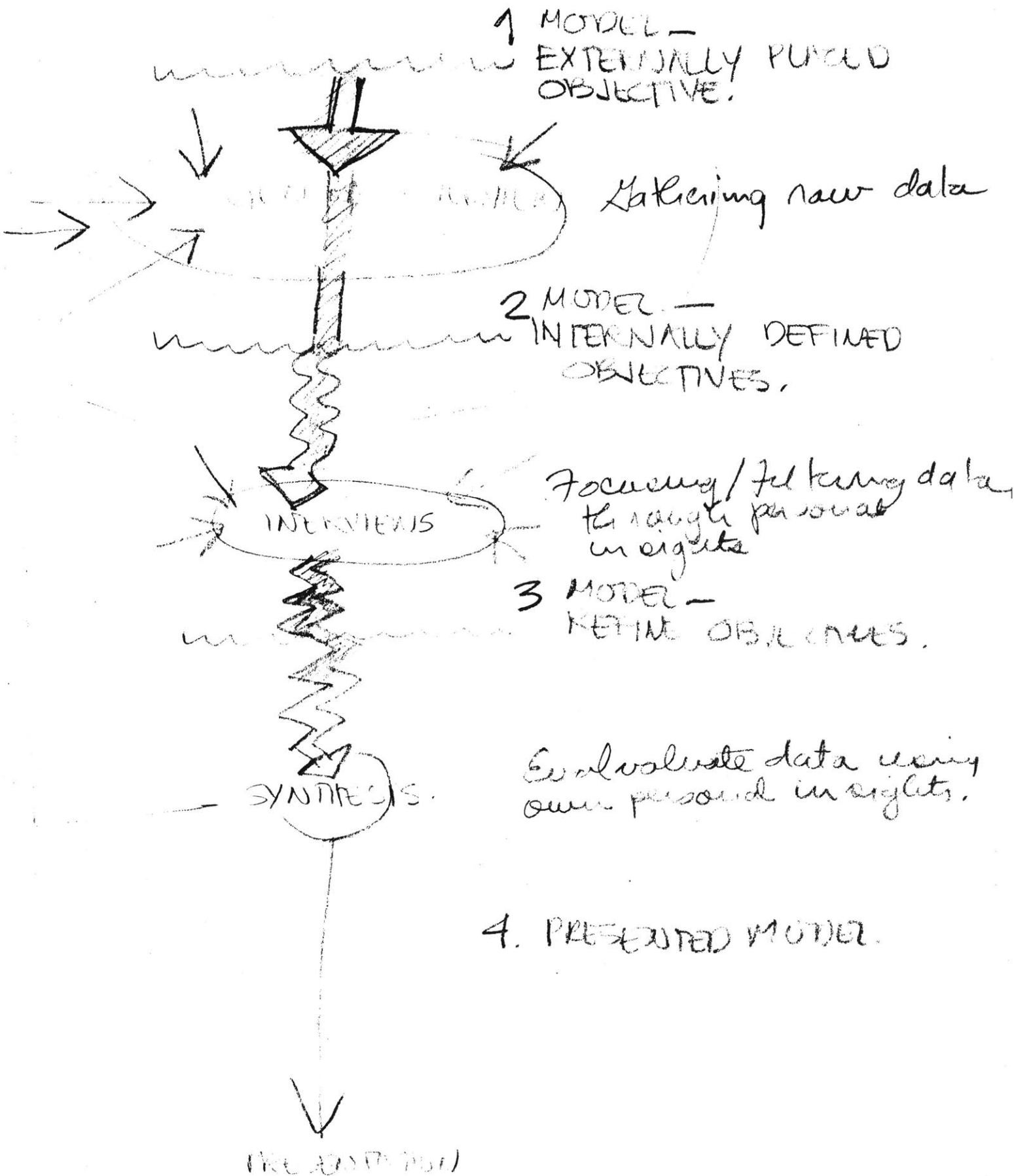
To begin, I just did straight research, tried to collect all the possible data that was available in Cambridge about it, data I could collect through mail, telephone. I reached a point where I could not collect anymore. At that point I had to move to California. So you can say, at the time I went to California, I had some tacit understanding of the problem but no personal understanding of the personalities of the people involved. So when I went to California at that point to get information, all the people I knew by name came alive and it gave the problem a new dimension. The third way was putting those two together as a way of finding out more information.

Please map out your problem definition process. (Talking while mapping his process.)

The first part was the one I described. I collected information from the library, mail, etc. and from speaking with experts in Massachusetts. For example, I was working on coastal land-use management. There are experts at MIT on land-use problems but who are not familiar with California.

From this, I got a set of approaches for defining the problem. So I went to California. This served two purposes: (1) to focus and (2) filter the problem. So some of the data were thrown out and other





data brought into focus.

At this specific point I had to synthesize the pieces of information. Then I feedback.

Please elaborate on that and be more specific.

I did not really have the opportunity to feedback. After presenting this to the class, there was a lot of comments. I found out which of the four tapes were most effective. I knew what was in those four tapes. We changed the ones that would be less effective but I did not have the opportunity to feedback. The next time I will have this.

What objectives were you trying to accomplish in each of these stages?

- This was to gain general knowledge.
- This was to gain personal insight.
- The problem at each stage was defined more clearly. The problem was never completely defined until I really entered the synthesis. So here we have the final problem.

The real objective in this synthesis stage is to communicate and evaluate it. Although the material was presented, the final and real objective was to present material to the class. The actual synthesis and evaluation occurred during the problem definition stages.

How explicit were each of these objectives/ideas to you at: (1) the commencement of each stage? (2) the end of activity? (3) the completion of the project? How do you explain your response?

These two objectives were very clear to me from the beginning. Because we had to produce materials for a group, I had to evaluate it and understand it. I think that individual objectives of stages were

clear to me in the beginning before I started gaining general understanding of the project. It was clear to me during the interview that that general understanding at the beginning was to be gained personally. This seems to me to be the critical place, this is the raw data. At this point, I synthesized the raw data into something. At the beginning you know that you want to do with the data but how exactly that is going to turn out, you don't know because I was producing a physical product (the case of slides). The case of slides is a physical constraint and I could only use those materials I collected during the interviews and I could not go back again. Another constraint was that I only had a limited depth of information. I wished it was much deeper. So, I was constrained by the two and how those two were going to come together. You really don't know until you go through it.

Who determined the objectives and how were they determined?

The project director defined the general parameters that he felt would be useful for the design. I defined from that what the general project was going to be. That is interesting because that came only after here (general information in Massachusetts) and before I got any personal insights, that I went through an objective defining period. (See diagrams). This we might call external objectives. Then I went through a general overview. Then I went through a time in which I defined my own objectives (internally defined objectives). Next I went through the interview process. I would say you probably refined your objectives here. And lastly, you synthesize the product and you finally present the project. So, in the general overview stage you

gather more data of other people. During the synthesis stage I was trying to use my insights and judgements.

Please be more specific about the different types of data you collected in all the stages. Where did you collect them and how did you analyze them?

I tried to smash them all into a bag.

Okay, in the general overview stage, I collected cases, reports on the problem, statistics, mainly printed materials except for the conversations over the phone. There were some magazines done on the project which I xeroxed, there were some journals, manuscripts - we call all these periodicals.

What subject matters were they dealing with?

They were dealing with two areas: (1) general land use and (2) the specific management of the California coastal zone. So, there were two levels of information dealing with the coastal zone: one on the general land use and the other - very specific. There was information published by the agency itself. We shall call this primary materials. I collected more of that when I went to California. This was a lot of materials. There were memos by their staff on such things as evaluations, finance, etc. All these were in the first section.

In the second section were tapes of interviews, photographs, slides, movie pictures. Because I was in California and I talked to the people, I collected a lot of the general overview data.

In the third stage, there was no data except for areas I felt were missing. When synthesizing a piece of information, you always find

that bits and pieces are missing here and there and you will want to collect more. So we have two models. The first model is externally imposed and the second is internally imposed.

In the presentation, there was no data collected.

How did you analyze the data?

In the general overview area, the method of analysis was not that specific: to gather data, to throw out what seemed less important and to attempt to narrow down the area of the problem. The California coast is a huge area and I could spend the rest of my life studying the whole area. So I had to narrow it down to what I was going to study - that was internally defined objectives. I suppose this is the third model. There is a fourth, actually, -it was the model I project.

It is the final model and they are all different.

How did you know when each of these objectives had been accomplished?

The first started to be when you begin to duplicate information and you cannot get any more new information, or when you realize that you have covered all the points. In the interview stage, which is to give personal insight into the problem, it is difficult to know when you have gotten enough information. I know the evening I was about to leave California, I felt reluctant to go because I knew there were more people I would have liked to talk to. But, as it turned out, the number of people I talked to was more than sufficient.

In the second stage things get more fussy because you are dealing with personalities. You need to know which type of personality to talk to because each person you talk to will say you should speak to

this kind of person or that kind of person. So, it is hard to say and know when you have had enough in each stage.

What skills, factors do you know of that effected the output of each of these models?

The first and most important skill, I think, is to be able to digest a large amount of information and to abstract a pattern from that information. This is important to your objective. From the same body of general information, there are a hundred-and-one ways to approach that body of information. This was a skill I brought to this project because I had done a similar project before.

There is also a skill I don't have in enough strength. That is, the ability to let your information right from the beginning influence further information you collect. I tended to collect as much information as I possibly could in the beginning which is a very inefficient method. It is a trade-off between efficiency and thoroughness. Two other important skills are:

- the ability to communicate freely and to tease out questions.
- the ability to evaluate and synthesize the data.

I also think you need a lot of design.

What type of design skills are you talking about?

I think any project is a design project. I was preparing a lot of written materials so I had to carefully design what went into the material and include just enough to get the points across and to avoid boring the people to whom you are presenting the materials. The

production of the slides and pictures was more than anything a design process. When you are producing films, slides, or tapes, you have to know how people respond to those kinds of stimuli. Filming two hours of people talking is too long. So you have to know when to interrupt your filming or taping. It is like doing a building. You know you cannot put a door in every five feet. You know you cannot have every room the same size. It will not work. Also, you cannot have every group talk on tape. It will not work. It is a design problem.

How did you acquire these skills?

I think one of the real strengths of an architecture education is that it teaches you how to handle problems of this kind. This is because in architecture education you are always dealing with physical things and you immediately see the consequences of what you do. If you don't design correctly, then you see it - which is unlike other, less concrete disciplines. This may be my bias. Somebody who has never done architecture may not be able to see problems in those kinds of structures. I can. So, my training gave me the ability to see many areas, many of which are unrelated, to synthesize them, and to evaluate the product, to reject those things that didn't work. So, in this project, it did not only help me to define the problem, it also helped to do it in the physical sense.

What other skills don't you have that you wish you had?

Being able to speak well and be at ease with people. How to use the library very well. To talk to people on the phone. Writing skills are very important.

Rank in order these skills

I will say design skills and I mean that very literally - in the same sense of designing a house for a culture, how much it will cost and the set of data that come into play. If we liken this project to building a house, then the interview in California is like interviewing architects who build a particular kind of house. They could give me all kinds of personal insights as to what it takes to build a house.

RESPONDENT G

How did you go about defining the design problem? State, describe and map out the stages (taking note of events in chronological order) that you carried out to define the problem from the very first contact with your client or even earlier, if there was an earlier stage. Please be very specific.

The design problem is a high school. The design problem is pretty well defined once you know the category of the problem. This is a high school, so you know such things that are required of it -- school committee's requirement in spacial organization and sizes of classrooms, library, etc. So you know the things that have to go into it and how they relate to one another. So in the back of your mind a program exists. The way this particular proejct went was that: given the program, the architect went home (office) and tried to do a design, and only consulted the school committee when they had one or two partisan possible designs. It was when they got that partly settled that they went to the faculty members for interior details to make sure that the administrative areas were properly organized in terms of partitions. For example, to make sure that the principal does not have to go through the conference room to see the vice principal. But at that point there was no choice as the amount of money spent was socially committed to form and not to redesign the school. The amount of money spent was arrived at by the architect therefore by working backwards and relying on his previous knowledge of schools.

On this previous knowledge and from cases precedented from journals,

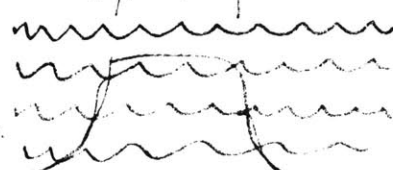
he knew that lockers are on the ground floor, the middle floor opens to everybody and classrooms are upstairs. One of the design problems was where to locate the building on the site. It was a slopey and marshy landscape. He had to locate the building on the vehicular and service access of the site. That he solved by calling in a landscape architect. The landscape architect recommended that the school had to go on the slopey part and the rest of the facilities had to go on the relatively marshy part. Now the problem was -- how do you put all these pieces you know belong together? How do you adapt them to the site? I do not know how he arrived at that but he did arrive at a design. I don't know whether structure had much to do with the design. But from what I saw, they were very much restricted by the budget and so they used the beam and lintel system and in concrete. Concrete was cheaper at that time. The real problem as I remember that they had then was even bay spacing. This was because the classrooms were of different sizes, some small and some large and they had to use multiple bays. There were also problems with the corridors. So, they had a space between one column to another column as a classroom and between one classroom to another classroom wall, they had a corridor. They thought of the mechanical. The only way to design for the mechanical was to stick it into the ceiling (to stick it into somewhere where they could cover it up with a dropped ceiling). I felt they should have thought more about it. In the gym, you can see ducts twisted around other ducts. They thought of it horizontally but not vertically. That was not part of the design.

For the different stage of the problem definition process, the way these guys worked was to find out what the needs were and program and figure out a way to make it on the site. So they talked to the landscape architects, consulted magazines. Mostly, they were thinking by themselves. They would go to the school committee and the building committee to show possible designs and say which of these do you like best. And when they felt the shape was committed, they then went right out there to figure out how it would work there. They got committed to a shape and they felt they could not back away from it. Then they began to find out things that would not work. I don't know whether this is a thought out procedure or not but they figured that they could adjust to that better than trying to let everything hang to everything. It is a way of dealing with the most certain thing first except for the money. So they got the design done and got an estimate from an estimator first. When that was done, they went to the school committee and the town meeting. The town meeting voted it down because it was too expensive. This was partly because it was too expensive and partly because there was one guy who felt that the temporary classrooms were considerably cheaper. So they got into a political agreement which had nothing to do with the design.

After a year the school population increased. The meeting was held again and voted the school in. The price for building the school increased and they could only get 3/4 of the school. So the architects had to redesign the school. But they ran into a problem here because they were already committed to a shape.

Problem Description

designer knows  
of needs



exploration

Attempts <sup>partial</sup> solution

mediated by  
tools designer  
is familiar &  
his confidence  
in his use of them

Test Solution  
in terms of solution  
model/template

model/template

filters of previous experience  
and knowledge which categorize  
problem as similar to something  
previously known to that designer

Tries to organize facts of problem  
in the same way / in same terms  
as what problem description  
category / model - use structure  
or features of template to guide  
solution

may happen on  
several sketches

**ANALOGY** - organizational  
problem develops <sup>architectural aspect mapped on to</sup> organization of analogy  
identity - free of model/template

- A. Logical in arch. sense: circulation, buildability
- B. Satisfy his feeling it can be developed in detail  
in aesthetic & personal terms
- C. solve detailed aspects: adjustments, etc.

Direct path unless solution is unacceptable  
to "client" (who may be architect)  
for whatever compelling reason.

What objectives were you (your firm) trying to accomplish in each of these stages?

The design objectives at first were to get the building sited. Do you mean how to get the staff organized? Or do you mean personal?

Talk about both.

Okay. I think the personal goal was to get the whole thing organized. At the same time, I think this is in the subconscious. Most of them were trying to do something that would be approved by their colleagues. By that I mean, something that will be fashionable in magazines and not on the things that will please the children who will use the building or that will make life more agreeable for them. The models that they had in their minds were the models they saw in the magazines. They hardly ever went to visit schools. When they did, they did not really think about it, i.e., what they have seen in terms of what it feels like to be in there or about what the place looks like. The fact that they didn't visit other schools really astonishes me.

The goal of the design was to get it done fast. And to do it, they had to go for what the school committee liked and not necessarily a good solution. Generally, they would present two or three schemes and have one favorite one then the other very early and began to identify with it.....So they got very personally committed to it and became identified with it.

I worked a little differently. I had a box within to work. I could change the structural system. I had a theatre, a musical area and a classroom guess to design. I had very little output to the money.

Partially, I think they did not know how much things cost. Very few offices know what it cost to do a stepped stage for an orchestra and stepped floor. Very few of them bothered to know how to figure..... and find it worthwhile to know what the difference is. They spent a lot of time trying to make decisions on an unknown basis. That is trying something by default. Whatever there is when the time comes to stop, you stop when the budget runs out or when the client complains honestly. So my process here was to meet the technical requirements first and to go out into the field and to the eventual users, the music teachers and drama teachers, to see what facilities they wanted and to critique what we have drawn up. In the case of the theatre, we spent three weeks on designing chair and side walks and all that technical stuff like how everyone could see the scenery. Here we consulted some technical consultants to give some advise. We worked for the first two days. The guy looking at what I had done told me that this would not work although the book says so. So we had to do the whole thing over.

Although the group said they looked after the budget, in actual fact they did not bother. The cost objective was to do the building fast.

So the design stage was to get it organized. The next stage was to find out what goes on in the interior. That appeared to be a technical thing and whose judgment was left to the eventual users. When the eventual users had accepted this, then we were ready for working drawings.

How were the design objectives determined?

The question of getting a design was given and so you had to come up with a design.

How was a pleasing and satisfactory design determined? They were determined implicitly and with what other colleagues would think in mind. They were not compliant about it.

How I determined my objective in the theatre, music and drama facilities -- they were given by the job captain and some of which were technical consideration. The personal objectives varied a great deal with the degree of identification with the design.

Cost objectives: They were conscious of efforts to come under the budget and to stay within the budget. This is understandable as the fees are according to the cost of construction. They computerized the cost of the building by average square footage.

The overall design objective was to design something that could be put into a magazine.

How explicit were each of these objectives/ideas to you 1) at the commencement of each stage? 2) at the end of each stage? and 3) at the completion of the project? How do you explain your response?

They are obvious but not explicit. In a sense, they are explicit but you don't really know what they mean. There is no way as you work your self through it to know whether your decision is affecting the budget or not. If it is \$450 per sq. ft., putting carpeting down or rugs or asbestos, there is very little way to figure out how you are averaging out the thing. If you know your asbestos tile area is 250

sq. ft. and is \$.50 per sq. ft., there are other issues at maintenance costs. There is a stringent way to do the minimum cost option. Since there was none, people kept moving backwards and forwards. You have got very generalized things. So, design to get something that works and is acceptable to the committee. And all you have got then, you just don't go back because the feeling is that you are going to waste time. Conversely there is no way to know when you are at the end of each stage. There is no way to know where you are. Well, when the project is completed, only very few architects go back to look at where he is. As a result, they do not have feedback. To architects, a successful project is one in which there are no complaints about it.

How do you explain this response?

This is basically a problem as most of the things have no way to be measured. There is no method of articulating them. There are methods but most of them are essentially ways of being subjective - partially because the methods that have been derived are very specific ones: structures, building cost, mechanical, etc. Architects are not convinced that these methods are useful.

The type data most architects collected also did not help (magazines, time saver data). They talked to the teachers and inferred from that how they use the building. This information was not helpful because it is technically oriented data. Then they are back to their own inclinations.

How did you know when the objectives have been accomplished?

Well, when nobody complains. You know when you cannot see any

major problems. Some of it is professional responsibility. How do you know when the design of the building is satisfactory? I think it is the place for professional judgment. You terminate a stage and move to another stage when the budget runs out. That sounds stupid. You set yourself up a schedule to know roughly how long it is supposed to take. Sometimes you say two months will be adequate to accomplish a stage. However, people do not distinguish between stages that strongly. Again when they describe their process they describe them in stages which are not that distinct.

- The criteria used were determined by taking the word of the experts they consulted and the client wholly without question and based their determination on them.

What skills / factors do you know of that affected the output of your process?

- Most of the skills were skills derived from experience; being able to draw, to visualize in three dimensions what you have drawn in two dimensions.

- You have got to be able to absorb what a program means.
- skills to deal with the school committee.
- How to be able to judge when something has been well organized.
- skills of being able to define problems using a scientific procedure.
- skill to know when a salesman is lying about his product.
- You can acquire some of these skills from the jury system in architecture education, but most of them can be acquired through reading.

What other skills you didn't have did you wish that you had?

I think the people in the office had skills in interpersonal relations. They needed to have skills to deal with small groups like the school committee.

Also I wished I had knowledge of the process of design and getting the thing was like. I think they didn't have any concepts to deal with it. I think if they had the concepts, they would have been able to interpret their experiences better. This raises the issue of the architect as a businessman or the architect as an artist. They have these general categories but there is nothing under it.

I wished there were better ways.

Did your design problem lend itself a scientific method of investigation?

I think they do but in a funny way. I think stating the problem helps you understand the problem explicitly as possible, but I do not think it helps you to investigate it. If I were to state the design problem I have just described, I will say - the design problem was to organize all these classrooms, labs, and other facilities into a unit that can be built within the budget. That will be the design problem and whether it was nice or matched with the landscape was not part of the design statement. One guy cared about it sitting nicely on the landscape while another did not. So it was a matter of personal preference.

I think the problem with the scientific method is that it implies that a lot of the variables are under control. But in architecture for some unknown reason they are not under control.

For example, what does the building look like at night as opposed to day and what effect does that have on people? You don't really know. And generally, there is no criteria generally recognized for evaluating an effect.

There is no way to measure it except for personal preferences.

Did you feel a sense of frustration in this project? When?

...It's in the human mind where you have some general features about a given problem. There is a certain procedure for making a mental concept. There is a certain way the mind is capable of creative concept and features of a building you are asking it to design. What one should be watching out for is not so much the specifics of the project as the nature of the process. If people knew that frustration appears at certain points, that may be useful. If you are frustrated, what to do is to walk away from it for a while or do some other product. But you will not solve a problem without a sense of pressure. Frustration could be that pressure.

How will you evaluate a P.d. process?

This is something I am puzzled about. I think p.d. is a very internal thing. I can grab a guy and say, what is your problem? He will say this and that and give a regurgitation of part of what I have said. Then, I say something general about what I think as a subjective process.

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