URBAN ORGANIZATIONAL SYSTEMS

by

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ABSTRACT

General systems theory provides a conceptual framework for the integration of knowledge from a wide variety of specialized fields. Systems theory serves to synthesize, reconcile, and integrate knowledge making it possible to unify analytical data into broader based theories.

By examining various systematic relationships, attention can be focused upon the interrelatedness of organization theory and physical planning. The juxtaposition of these two disciplines within a systems context has particular application in the design of urban settlements in developing countries.

The lack of organizational capability and the inability to influence the environment contributes to the continuing cycle of poverty of the urban poor. By structuring and integrating their activities, the poor would be better able to participate in the planning and the implementation of projects which affect their lives. The development of organizational systems can increase the capacity of individuals to change their relationship to the environment to one of greater influence and control. Further, the designs of physical layouts have potential for determining social systems which enhance the idea of interrelatedness.

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The presentations in this thesis within the field of Organizational Research and Management Science are not purported to be extensions of knowledge in those areas. As an architect, I have come to appreciate the strides which have been taken in O.R. and M.S. which can have a significant impact upon our profession. What is newly presented is the juxtaposition and the interrelationship between the topics within the context of General Systems Theory.

The author gratefully acknowledges the impetus to this investigation which was supplied by Professor Raymond Levitt and his course, Project and Company Organization (1.431); the guidance and advice received from Mr. Robert Youker, Economic Development Institute, World Bank; the editorial assistance from Professor Robert Sprich, Professor of English, Bentley College; and the encouragement, support, and invaluable assistance from my advisor, Professor Horacio Caminos.

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PREFACE

BACKGROUND. Dramatically lowered death rates combined with high birth rates are causing a global population explosion in which over one million people are added to the world's total every five days. In less than 50 years, global population has doubled to 4 billion people. The World Bank estimates that by the end of the century the total will climb to 6.3 billion. By the year 2020, it will reach 8 billion and will continue to rise until it stabilizes at 11 billion. Greatest increases are within the poorest segments of the developing countries where life is a continuing cycle of poverty and high birthrates.

Linked to rapid population growth is the migration from the countryside to urban areas. Attracted by the prospects of a better life, millions each year continue to gravitate to cities where some populations have quadrupled in a decade. Unprecedented urbanization taxes already strained resources and aggravates the growing gap between the traditional power structure and the poor whose ranks swell by the thousands each week.

- The magnitude of the influx has exceeded the capability of the public sector to provide even the most meager shelter. The availability of housing is outstripped by the exponentially increasing demand for land, dwellings and services.
- The lack of adequate housing forces increasing numbers of urban dwellers to live in squatter settlements with inadequate water, sanitation facilities, health care, and other social services.
- The unplanned and uncontrolled sprawl contribute to inefficient use of land and other resources whose availability is finite. The provision of utilities and essential services is difficult and uneconomical.
- The adoption of an attitude of "benign neglect" by governmental bodies toward squatter settlements fails to address the important issues. Development programs are implemented to insure that the bureaucratic system merely functions and not that it achieves results.
- The planning and implementation of projects fails to take into account the interdependence of these two processes. The poor are subject to remote institu-

tional decision making over which they have no control.

The lack of organizational capability in the developing countries allows the menace of overcrowding to continue by not focusing upon the interrelatedness of problems and their possible solution. Central directives fail to take into account local needs and popular initiative.

The transition from rural life can be devastating. In leaving the countryside, the migrant becomes detached from ingrained cultural patterns which have guided his life and the lives of his ancestors for generations. Without sustenance supplied by familiar and trusted associations, he is unable to maintain the equilibrium necessary not only to cope with the ordinary shocks of life, but also to become a potent force in influencing its direction as well.

- Without an established social system which can structure and integrate activities, purposive action beyond individual effort becomes difficult to sustain.
- Without the ability to influence the environment, one is subject to it. Behavior becomes passive, indifferent, or hostile.
- Without an organized constituency, the urban poor cannot make their needs known. Their basic needs cannot be fulfilled unless they participate in the decision-making which affects their lives and unless they become a power center capable of negotiating its own best interest.

The problems of providing a viable social system cannot be solved without the active individual participation of the poor as part of an interdependent, cooperative effort. Human resource organization allows significant and well-defined issues to be addressed within rapidly changing circumstances using minimal resources. By enhancing group formation and by increasing the capability of local constituencies to isolate and to solve their own problems, self-managing systems can be created. Where people participate in their own development, a sense of purpose to life and work stimulates the establishment of goals for responsible individual and community action.

To be sure, the actual restructuring of priorities to satisfy the unmet needs of the

urban poor involves coming to grips with an intricate web of worldwide economic, social, and political considerations. What will ultimately provide direction to throttle exploding population growth and to alleviate debilitating poverty is the value system of world culture. Currently, the world's value system chooses to minimize the plight of those who exist below subsistence level.

OBJECTIVES. This thesis is addressed to the problems of urban organization; namely, the relationship of physical layouts to social structures using a general systems model. It proposes a conceptual framework to identify the relationships between organization design and structure, alignments for urban development, group dynamics, and urban layouts. By comparing elements common to organization theory and physical planning, attention can be focused upon the patterns of interrelatedness between these two disciplines which might otherwise go unnoticed. The prodigious efforts aimed at coordinating human interaction being provided by the behavioral sciences at the demands of technological stimulation must be recognized for their potential in fulfilling the basic needs of the poor. The strides being taken by Organizational Research and Management Science are outstripping those of planners and architects whose preoccupations tend to overemphasize more ethereal issues.

The basic conclusions of this thesis are: First, the urban poor, by structuring and integrating their own activities, would be better able to participate in the planning and implementing of projects which affect their lives. Second, the development of organizational systems increases the capacity of individuals to change their relationships to the environment to one of greater influence and control. Third, the designs of physical layouts have potential for determining social systems which enhance the idea of interrelatedness. Grid (cluster) block layouts promote systematic social structures; gridiron blocks do not.

CONTENT. This thesis is subdivided into six sections. The sections are intended to progressively amplify the intent expressed in the objectives. The interrelationship, the link between each section is the general systems model itself.

I. URBAN ORGANIZATION AS A SYSTEM. This

first section establishes relationships between organizational development and general systems theory which proposes that organizations are part of a system whose activities are continuing cycle; further, that organizations exist in an environment as part of a dependent relationship. The environment both sustains the organization and at the same time challenges its survival by subjecting it to changing physical and social-economic forces. These forces are a major source of uncertainty for the organization.

II. URBAN ORGANIZATION SUBSYSTEMS. This second section establishes relationships between the interdependent organizational subsystems which are formed to further the objectives of the organization. Two such subdivisions are the managerial and structural subsystems. These subsystems subdivide even further into more specialized units. Subsystems are structured to adapt to specific conditions of environmental influence and task requirements.

III. ORGANIZATIONAL ALIGNMENTS FOR URBAN DEVELOPMENT. This third section establishes relationships between the parts of urban organizations and proposes that the entire system is dependent upon homeostasis or a dynamic equilibrium for its survival. This section compares two existing development strategies, top-down and bottom-up, and proposes an adaptive strategy for urban organization.

IV. GROUPS, PRIMARY COMPONENTS OF URBAN ORGANIZATION SYSTEMS. This fourth section establishes a systematic relationship between individual behavior and group formation. Formal and informal groups are discussed together with the units of analysis within groups, norms and rules. This section suggests that urban dwellers might expand their influence and increase their chances for survival through group activity.

V. URBAN LAYOUTS. This fifth section establishes the relationship between group formation and physical planning. Circulation systems define block layouts which, in turn, determine circulation patterns, land subdivision, utility networks, and social structure; Grid (cluster) blocks establish definite physical boundaries for small social units which could foster group activity.

VI. APPENDIX. This sixth section provides supporting and complementary references. Included is a hypothetical example which serves to guide the selection of an appropriate on-site sewage disposal technology. The incor-

poration of these selection guidelines is intended to demonstrate how the participation in the planning, construction, and management of sanitation disposal might facilitate control over the physical environment.

I. URBAN ORGANIZATION AS A SYSTEM

ABSTRACT. A systems view of urban development organization provides a basis for integrating urban development problems, organizational theory, and environmental influence upon the organization. Utilizing, simultaneously, general systems theory and the realities of a specific context from a contingency view it is possible for urban organizations to structure and integrate their activities to accomplish their objectives. By setting limits to their definition of situations and by continually monitoring their environment, organizations become increasingly capable of predicting consequences and selecting alternatives.

The organizational and managerial techniques which have been widely applied by international lending institutions and national governments to the problem of urban shelter have not produced the desired results. Urban development efforts are beset with environmental and socio-economic variables whose number and intensity increase with the passage of time. Even the most imaginative planning efforts suffer from deficient organization and inadequate management which misappropriate basic resources. The natural, human, and technical resources of developing countries are in short supply. The competition for these scarce resources must be organized and allocated to self-sustaining productive use. An organizational system is needed to isolate and solve the problems of urban management to secure the gains which can accrue from collective organization. The purpose of an organization is to accomplish objectives. Organizations are the means through which individuals as members of a collective entity can complete tasks which are beyond their individual capability.

> Organization behavior is directed toward objectives that are more or less understood by members of the group. The organization uses knowledge and techniques in the accomplishment of its tasks. Organization implies structuring and integrating activities, that is, people working or cooperating together in interdependent relationships. The notion of interrelatedness suggests a social system.[1]

Organizations consist of people. Ultimately, their general nature must be considered. Organizations require coordination and its essential requirement, communication. Organizations motivate people to contribute cooper-

ative efforts and instill within them the importance of purpose. Willingness to cooperate cannot develop without an objective for cooperation; namely, purpose. Purpose is the coordinating and unifying principle of organization.

An organization is not merely an assembly of individuals or sub-groups constituted to achieve particular goals: it is instead a system of consciously coordinated activities, an integrated collection of actions and interactions having a continuity in time.[2] Barnard was one of the first writers to recognize the organization as a system. He conceptualized that organizations are only partial systems and exist at a myriad of levels and hence are impossible to isolate. They are, he theorized, composed of various sub-units which in themselves are organizations. In addition, each organization is part of a bigger and more complex organization, a part of a system whose activities are a continuing cycle. Systems theory provides a basis for integration of elements by conceptually indicating a way to view the total organization in interaction with its environment and for viewing the relationships between its internal components and subsystems. This holistic view is basic to the systems approach.

Systems theory is basically concerned with relationships, or structure, of interrelatedness and interdependence. It emphasizes the composition of elements related to and dependent upon one another, but when these elements interact, they form a unitary whole. Systems have boundaries that separate them from their environment. Boundaries circumscribe the sphere of influence of an organization's activities. The concept of boundaries amplifies the distinction between open and closed systems.

CLOSED SYSTEMS. The closed system has rigid, impenetrable boundaries. This property generally relates to physical, mechanical, and biological systems where boundaries can be identified. It relates to self-contained structures which can be effectively isolated from external forces. The closed system because it is isolated, evolves internally. It is subject to the forces of entropy, which gradually increases until the entire system fails or falls into disorder.

Closed systems are characterized by fixed boundaries which control complexity and un-

certainty. Thompson observed that the accurate prediction of the state of a system depends upon its degree of determinacy. Variations and relationships must be few enough to allow comprehension and to control present and future states. According to Thompson, the control of complexity "requires that the system be closed or if closure is not complete, that the forces acting upon it are predictable."[3] A closed system is closed loop. No external input is recognized. The environment is ignored. The elimination of uncertainty to achieve determinateness, consistency, the search for efficiency, performance, and goal achievement have been guided by a closed system strategy.

OPEN SYSTEMS. The open system is characterized by fluid, highly permeable boundaries between itself and a broader supersystem. This approach is characteristic of social organization. Boundaries are not easily defined and are determined for the most part by functions and activities of the organization. Open systems exchange information, energy, or material with their environment. The open system can be viewed as a transformation model. In a dynamic relationship with its environment, it receives inputs, transforms inputs into through-puts, and exports outputs back to the environment. Open systems are subject to equifinality, which suggests that results can be achieved with different initial conditions and in different ways. The descriptions enumerated in figure 1.1 are not definitive. They are intended to express distinctions which separate open and closed systems.

Most pragmatic views regarding complex organizations become polarized around these two models. The closed system pursuing certainty; emphasizing only variables which promote goal achievement and subordinating them to monolithic control. The open system accepting uncertainty from environmental interdependence; affirming survival instead of goal achievement. Most traditional organization constructs tend to deal with closed systems; on the other hand, contemporary ones deal with open systems to maintain alignment with the environment.

Implicit in the idea of an organization as an open system is its continual, dynamic interaction which allows it to remain in equilibrium by perpetual exchange of materials, energy, and information. It would be impos-

sible for the system to survive without the uninterrupted input of energy from the environment, the transformation of the imported energy, and the outflow of transformed resources back to the environment. The open system views the organization as more than just a series of related parts. It reflects the idea of synergism, namely that the whole is greater than the sum of all its parts.

At the heart of the open system are the processes, operations, or channels which transform the inputs into outputs (see Figure 1.2). The organization's internal network subsystems transform the inputs into desired outputs. From the organization structure point of view, the most critical determinant is this transformation process itself. Actually, the transformation design involves a closed-system analysis. The closed-system aspects of the transformation process are concerned with the interrelated and interdependent organization subsystems of structure management, and technology. These subsystems must be organized in such a way that they will lead to goal attainment or output.

When approached as a natural/open system, the organization is a set of interdependent parts which together make up a whole. Each

Figure 1.1a

STRATEGY COMPARISON

CHARACTERISTICS	CLOSED SYSTEM	OPEN SYSTEM
Generic Class	Mechanistic Structural	Organic Behavioral
State	Static	Dynamic
Organization Design	Hierarchical	Departmental
Information Structure	Channelized	Fluid
Environmental Relationships	Placid Closed Ignored	Turbulent Permeable Receptive
Adjustment to Change	Inflexible	Pliable
Decision Making	Routinized Maximizing Dogmatic	Decentralized Satisficing Fallible
Motivation	Goal Seeking Maximum Efficiency	Survival Satisfactory Accomplishment
Authority	Defined	Diffused
Leadership	Authoritarian	Democratic
Loyalty	Expected	Voluntary
Management	Bureaucratic	Contingent
Task type Optimization	Programmable	Vague
Resource Use	Efficient	Uneconomical
Cause	Discursive	Intuitive
Effect	Circumscribed	Synergistic

part contributes something and receives something from the whole. The whole, in turn, is interdependent with some larger environment. Survival of the system is taken to be the goal. The parts and their relationships are determined through evolutionary processes.[4]

While an organization can be an internalized system of highly complex and consciously coordinated procedures, its most significant challenges for survival are forces which lie outside its boundaries but within its environment. Environmental variables both sustain organizations and at the same time limit their action. The survival of an organization depends upon the maintenance of a complex equilibrium in a continuously changing environment of physical, biological, and social materials, elements, and forces, which calls for readjustment of processes internal to the organization. These environmental forces impose sanctions upon organizations.[5]

ORGANIZATIONAL ENVIRONMENT. The planning and implementation of urban development projects must maintain continuing interaction with their external environment if they are to be effective. In a rapidly-changing context, organizations must recognize and constantly

Figure 1.1b

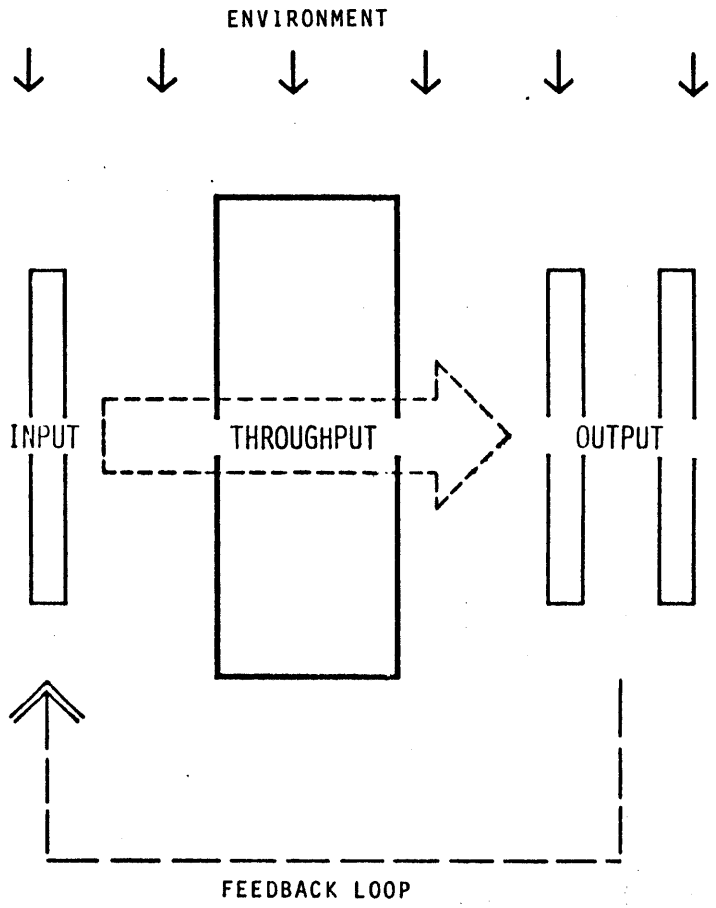
STRATEGY COMPARISON

CHARACTERISTICS	CLOSED SYSTEM	OPEN SYSTEM
Tolerance for Ambiguity	Low	High
Proclivity	Certainty	Uncertainty
Political Orientation	Conservative	Liberal
Time/Space Propensity	Status Quo	Change
Coping Cycle	Rigid	Adaptive
Chronology	Traditional	Modern
Methodology	Deliberate Planned Systematized Alorithmic	Evolved Unregimented Improvised Heuristic
Model	Rational Logical	Natural Facile
Relationships	Formal	Informal
Processes	Programmable Automatic Analysis	Unpredictable Spontaneous Synthesis
Affiliation Mandate	Institutional	People oriented
Tasks	Repetitive	Varied
Inputs	Homogeneous	Heterogeneous
Transformations	Specified Accomplishment	Comprehensive Accomplishment
Conflict Resolution	Subliminal	Consciously planned

adjust to the physical and socio-economic variables of the environment. To ignore these variables or to incorrectly assess them, places formidable obstacles in the path of the system. To coordinate its activities and to define its position within the environment, the organization sets up boundaries.

The boundaries which the organization establishes between itself and the environment, however open and permeable, must be able to selectively modulate inputs and outputs. Inputs must be aligned with the potentials and limits of the organization to keep it from becoming overwhelmed. The production of outputs must be synchronized with the productive capabilities of the transformation process in order to maintain standards. For example: The most pressing problem facing urban development organizations is that of burgeoning population. Studies by the World Bank have shown that higher levels of health, education, and non-agricultural employment are associated with lower levels of fertility. [See Appendix (1).] Input resources of time, technology, people, financing can be transformed by special elements of development, education, improved nutrition and health standards, and controlled urbanization producing

Figure 1.2 OPEN SYSTEM/GENERAL MODEL



RESOURCES	TRANSFORMATION	SERVICES
MATERIAL	PROCESSES	QUANTITY
TECHNOLOGICAL	MANAGEMENT CYCLE	QUALITY
HUMAN	ORGANIZATIONAL STRUCTURE	COST
FINANCIAL	SUBSYSTEMS	EVALUATION

declining levels of infant mortality. Outputs appear to be significant reductions in fertility. The effect of this output is synergystic. Lower populations can result. Lower population growth in turn can reduce pressure on resources. For changes such as these to take place, development organizations must gauge inputs on their ability to make transformations in specific elements of development, literacy, nutrition, and infant mortality for the output to result in lower birth rates.

In addition to their functioning as screening devices for inputs and outputs, the organization's boundaries provide a measure of independence and autonomy for the performing subsystems against intrusion by the environment. Adjusting to the environment through its boundaries, the organization design must incorporate into its structure the assignment of 'boundary spanning functions' to different managerial levels as we shall discuss later. Coping with the environment requires boundaries, subsystems to carry out boundary spanning functions, and recognition of what the realities of the environment really are.

The considerable range of environmental variables requires a systematic categorization of relevant elements. For urban development projects there are several different overlapping classifications.

1. Natural-physical elements place constraints on project development which are governed by the physical and biological sciences such as climate, floods, earthquakes, and naturally occurring phenomena which are above and below the surface of the ground. Since control of these phenomena is not possible, integrated adaptation is required. Organization interaction capability depends upon the degree of technological and scientific development. On urban development projects the installation of a water supply system cannot be considered to be simply a problem of design technology. Numerous other conditions must be satisfied if the program is to be successful. If water is brought into a project, how will waste water be disposed of? Are trained mechanics available to service pumps and equipment? Will financing be available for spare parts, chemicals? Does an administrative structure exist or can one be developed which can assess charges and make disbursements? Unless these factors are

taken into account, the system can fall into disuse and large segments of people will be without water. The physical environment can become polluted unless an integrated view is considered. One which is consistent with the technological capability of the program environment.

2. Socio-economic elements include the entire conglomeration of "contrived" social structures including their "actors" (individuals, groups, institutions) and "factors" (attitudes, trends, laws). There exists within every society a matrix that represents the interplay of these socio-economic elements which have gradually evolved forming a "stream of action." Special interests try to influence these forces to promote their own purposes and goals through the use of power.

The national government, the seat of power in most countries, is the initiator of most urban projects. Monolithic structure controls the political power and resources which influence virtually all development. Project beneficiaries cannot influence current development paradigms without a power structure of their own whereby they can establish their presence and ascendency.

3. Metaphysical elements are cognitive or theoretical conceptions which promote the establishment of interactions between the organization and its physical-natural and socio-economic variables. This listing is illustrative and not intended to be exhaustive.

Hierarchy - exists at the level of each subsystem and in the relationship of the organization to its environment, i.e.

Government - national, regional, local

Local - community, neighborhood, family

Family - parents, adolescents, children

Power Distribution - represents the forces which allow the organization to exert control over the environment and vice-versa.[8]

Controllable - organization can effect these without affecting the organization.

Influencable - organization can control these but they can also affect the organization.

Appreciated - organization must react to these but cannot affect them.

Diversity - is the degree to which the environment is heterogeneous. Diversity has an impact on the design of organization structure. Greater diversity compels organization decentralization.

Hostility - is the result of competition between the organization with the environment and available resources. Hostile environments are unpredictable ones. Very hostile environments demand rapid responses from the organization and, therefore, tend to centralize structure at least temporarily.[9]

Uncertainty - is an event for which little or no probability exists for a successful outcome. The environment, because it is subject to frequent changes, is the major source of uncertainty for the organization. The degree of uncertainty changes with time. Organizations, therefore, must monitor the environment on a continuing basis and generate adaptive responses to meet varying conditions. As the environment becomes more dynamic and uncertain, organization structures are required to be more organic.

In urban development projects, adaptation to environmental uncertainty can be enhanced by the participation of program beneficiaries in the design and execution of projects. Increased autonomy at the implementation level provides decentralization for continuing interaction and responsiveness to change.

For the organization to establish itself with potency in the environment, it must first be able to identify those elements which are relevant, and then classify them in a way that they can be monitored. Such surveilance must be continuous to establish how changes affect the organization. Once the relationships are established between the organization and key environmental elements, organizational skills can be developed to manage their interaction.

A TURBULENT ENVIRONMENT. As the urbanization process proceeds at an accelerating rate in the developing countries, the environmental context for urban development programs is becoming more complex. Organizations must increasingly develop more adaptive and responsive structures and processes if they are to cope with the uncertainty caused by turbulence.

The work of Simon, March, and Cyert emphasizes the organization as a problem-facing and problem-solving system with courses of action available. Organizational environment does not divulge alternatives nor their consequences.

> In this view, the organization has limited capacity to gather and process information or to predict consequences of alternatives. To deal

> with situations of such great complexity, the organization must develop processes for searching and learning, as well as for deciding. The complexity if fully faced, would overwhelm the organization. Hence it must set limits to its definitions of situations; it must make decisions in bounded rationality. (Simon, 1957b). This requirement involves replacing the maximum efficiency criterion with one of satisfactory accomplishment, decision making now involving satisficing rather than maximizing. (Simon, 1957b)[10]

As a corollary to this proposition, Thompson observed that the value of rational and natural systems applied simultaneously should not be overlooked. He postulated that it was possible to "conceive of 'organizations' as open systems, hence indeterminate and faced with uncertainty, but at the same time as subject to criteria of rationality and hence needing determinateness and certainty."[11]

The general nature of open systems concepts does not have universal application, Systems theory requires the stimulation of a particular context, it attempts to bridge the gap between theory and practice.

A CONTINGENCY VIEW. While general systems theory provides a metaphysical basis for the study of organizations, its concepts are abstract and general. There are no universal principles or procedures which can apply to all situations. The science and theory of organizations seek to establish fundamental relationships. It is necessary to apply these concepts to specific organizations and specific situations. Open systems strategy recognizes the environmental input, the contingency view relates the environment to specific organization structure and processes. A contingency view of organizations takes into account the realities of a particular context.

A contingency view recognizes that the environment and the internal sub-systems of each organization are different and as such require an organization design that applies to a particular situation.

> The contingency view of organizations and their management suggests that an organization is a system composed of subsystems and delineated by identifiable boundaries from its environmental supra-system. The contingency view seeks to understand the interrelationships within and among subsystems as well as between the organization and its environment and to define patterns of relationships or configurations of variables. It emphasizes the multivariate nature of

> organizations and attempts to understand how organizations operate and attempts to understand how organizations operate under varying conditions and in specific circumstances. Contingency views are ultimately directed toward suggesting organizational designs and managerial actions most appropriate for specific situations.[12]

The contingency view suggests that patterns exist for similar type organizations. The studies of Woodward, Lawrence, and Lorsch and Burns and Stalker have tended to confirm that mechanistic organizations are effective in stable environments while organic organizations are effective in dynamic environments. See Figure 1.3. Their studies also concluded that if an organization's internal environment is compatible with the external environment, the organization will tend to be effective.

The environment for most urban development programs is uncertain and heterogeneous. Organizations for development, therefore, should be relatively unstructured and follow an adaptive-organic system. However, processes which will solve problems in a particular village in Africa cannot be implemented identically in a Latin American barrio.

Systems and contingency concepts provide a

Figure 1.3

CONTINGENCY VIEW

CHARACTERISTICS	STABLE-MECHANISTIC SYSTEM	ADAPTIVE-ORGANIC SYSTEM
Environment	Stable and certain	Uncertain and turbulent
Goals	Defined and enduring	Diverse and changing
Technology	Uniform and stable	Complex and dynamic
Activities	Routine	Unusual
Objectives	Productivity	Innovation and creativity
Leadership	Authority oriented	Mutual confidence and respect oriented
Conflict Resolution	Managed by authority relationships	Creative problem solving
Activity Orientation	Individual emphasis	Interdependence between and within groups emphasized
Task Complection	Strict division of labor	Multi-group membership and responsibility
Decision Making	Programmable	Heuristic
Structure	Hierarchical	Departmentalized

behavioristic/pragmatic body of knowledge that can assist urban organizations to operate in various environmental and technological contexts. They also provide guidelines for organizational action in specific contexts. Systems concepts and contingency views cannot provide "recipes" for managing all organizations; they can assist in making the most appropriate "fit" between the organization and its environment and its internal organization design. An appropriate "fit" will lead to greater effectiveness, efficiency, and participant satisfaction.

SUMMARY. Organizations are groups of people with a purpose formed to accomplish objectives. Organizations are systems, needing certainty, which interact with and are contingent upon the environment. Organizations and their projects establish relationships with internal sub-systems and with other organizations in their environment. By structuring themselves, using open systems and contingency views, and by developing processes, organizations can influence their environments. Urban development projects, to succeed, must have clear objectives and realistically assess the environment. Their structure must be sufficiently decentralized to allow the participation of beneficiaries and to eliminate uncertainty. Urban development organizations, to keep from being overwhelmed by a turbulent environment, must set bounds where they can control activity. Urban organizations must develop processes for searching, learning, and deciding to achieve satisfactory accomplishment.

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II. URBAN ORGANIZATION SUBSYSTEMS

ABSTRACT. The principal function of management is to establish a synchronized relationship between the organization and its environment. Management is also responsible for developing integrated subsystems which, through cooperative effort, promote the purposes and objectives of the organization. By further dividing subsystems into sub-subsystems, it is possible to demonstrate how a departmentalized organization can perform the basic management tasks of planning, executing, and controlling.

As open systems, organizations are in continuous interaction with the environment. The survival of the system depends upon uninterrupted inflow, transformation, and outflow of energy, information, and material. To complete the transformation process, organizations create managerial subsystems to integrate and structure activities within the framework of available knowledge and environmental constraints. Complex tasks require that specialized subsystems screen inputs, make transformations, and issue outputs. These subsystems are interdependent, and coordinate their effort subject to the uncertainty of the environment.

Organizations cope with uncertainty and the need for differentiated knowledge by expanding the system to include sub-systems specifically designed to collect and utilize information while facing uncertainty in varying ways.

Urban development programs require inputs from specialized departments to plan and direct project activities according to a "project management cycle;" see Figure 2.1. The project management cycle guides the process which receives inputs from the environment through specialized subsystems, transforms inputs, and issues outputs to the environment in a continuing cycle. Management is the process that links subsystems and establishes a boundary-spanning relationship with the environment. The key element of the management process is the managerial subsystem.

MANAGERIAL SUBSYSTEM. The managerial subsystem is the pivotal part of the organization in that it directs the activity of all other subsystems and establishes the relationship of the organization with the environment. Managerial activity is carried out at three sub-subsystem levels. The difference between

these sub-subsystems is the degree to which they exhibit responsibility and control over the fundamental administrative tasks or processes of the management cycle; namely, planning, executing, and controlling. The three sub-subsystems are strategic planning, management control, and operational control.[2] These sub-subsystems have been characterized in a variety of ways, however, their functions and interactions have been somewhat universally recognized.

OPERATIONAL CONTROL SUB-SUBSYSTEM. This level is where the basic work of the organization is accomplished. Products are produced and distributed, services are performed, the cognitive process is joined with the physical reality. Tasks are specified, little judgement is required, focus is on execution. The transformation of inputs into outputs takes place at this level. In the interest of efficient task performance, the system is relatively closed and protection from the external environment and elimination of uncertainty are desirable. The performance level will fulfill its role requirements best if the number of variables acting upon it are as few as possible, and the likelihood of uncertainty is minimized. Procedures are programmable, decision making uses routine techniques. In an urban development context, the parallels with operational control are rather obvious. Depending on the hierarchical level of the system, performance could represent actual execution of physical work, (installation of services, electricity, water, sewage, the construction of buildings). In terms of programs, it is the actual implementation of objectives. The operational control level requires technical competence to execute and operate projects.

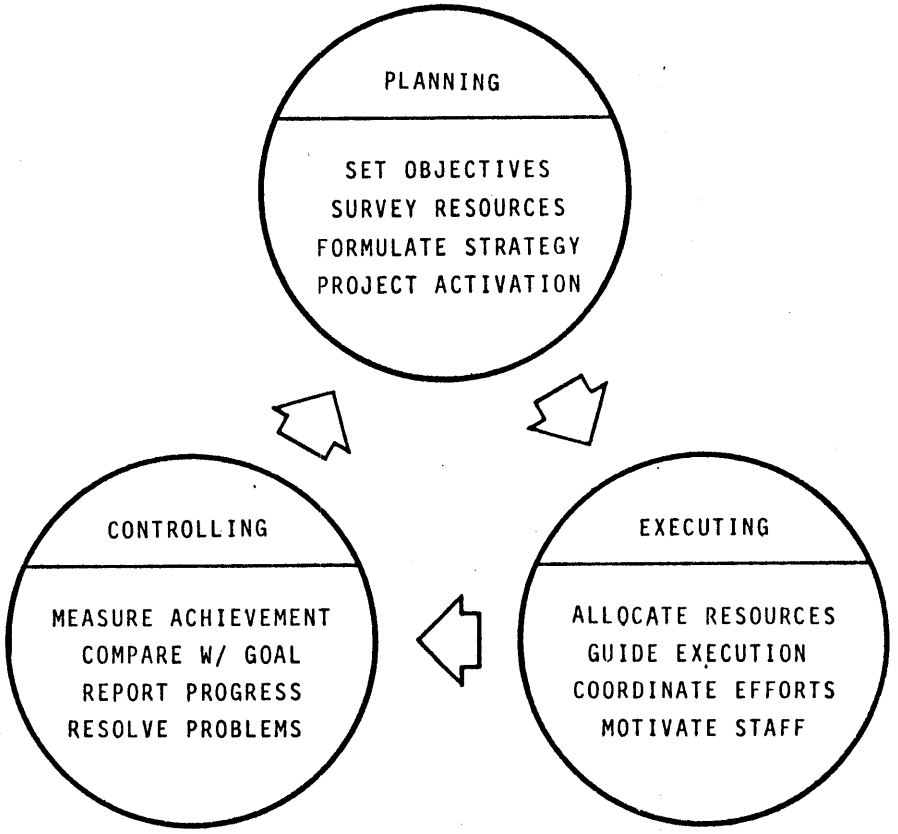
STRATEGIC PLANNING SUB-SUBSYSTEM. The primary responsibility of the strategic planning level is to define the position of the organization within the environment. It governs the interaction with the environment by setting boundaries. This planning level is the negotiator for outside influences and is responsible for finding the correct "fit" for the organization in the environment.

The institutional patterns in which the organization finds itself are pre-ordained. If it is to survive, the organization must work within this "environmental flow" by adapting, anticipating, and directing its ac-

tivities. It must "go with the flow" or negotiate new rules. The planning level is the arbiter between the organization and the environment. It must maintain a pace of change which is not only aligned with the environment but also is consistent with and not disruptive to the organization. The strategic planning level must develop and make available strategies for searching, learning, and deciding which can be useful in establishing the environmental position of the organization.

Strategic planning is a process of deciding on objectives and for assembling and combining resources to complete these objectives. Strategy implies long range and "the big picture," it implies responsibility for supervision and smooth operation of the organization, allocation of resources, assignment of tasks, resolution of conflicts, and control of information flow. At this boundary-spanning level, organization borders are permeable, exposure to variables is great, and uncertainty is guaranteed. Typically, orientation of processes is unpredictable and the posture toward the solution of complex problems is "satisficing."

Figure 2.1 MANAGEMENT CYCLE*



*From an unpublished article by John W. Huang of the World Bank, Economic Development Institute.

MANAGEMENT CONTROL SUB-SUBSYSTEM. The activity of the management control level focuses principally upon mediating the interaction between the strategic planning and operational control levels. Its primary concern is integrating internal activities. Supervision is direct; resources are directly allocated; rules, plans, schedules and information are interpreted and disseminated; conflicts are resolved; and the environment is monitored. Managers perform the same supervisory and boundary spanning functions as the strategic planning level but within a more limited sphere. Interaction with the environment is horizontal with other units within and external to the organization. A pragmatic perspective persists which allows the integration of task performance consistent with strategic objectives. "Focus is on the flowing stream of ongoing operations."[3] Contingency potential exists. Uncertainty is present, the adoption of open-system procedures is desirable.

The comparisons shown in Figure 2.2 are illustrative of possible predispositions when one compares characteristics with each sub-subsystem level. While each level may display different tendencies, it is important to remember that all three levels are interdependent elements whose integration must be facilitated by the organization.

After a system has been sub-divided into subsystems for specialized action, the problem then is to establish the nature of the mutual interdependence of the subsystems and to decide upon the integrating devices which can facilitate their adjustment to each other toward the completion of objectives. Internal interdependence of the subsystems and to decide upon the integrating devices which can facilitate their adjustment to each other toward the completion of objectives. Internal interdependence implies a reliance of one part within a system upon another. Combinations of interdependencies are variable. Thompson introduced a conceptual scheme which outlines the interdependence of parts.

Pooled interdependence: elements share common facilities but are otherwise independent. Failure of one part of the system does not necessarily threaten the whole system contingency is isolated.

Sequential interdependence: elements work in series. If one part of the system breaks down, the system must be readjusted; contingency potential exists.

Reciprocal interdependence: elements work back and forth among themselves. They receive inputs and give outputs to one another. The dysfunction of one part of the system affects the past and future states of the system; contingency is guaranteed. As the degree of contingency increases, interdependence becomes increasingly difficult to coordinate. Further, as the difficulty increases the "cost" of coordination also increases.

A directed effort of subsystems to achieve objectives requires coordination. The kind of coordination depends upon the degree of uncertainty which exists in the relationship of the subsystems to each other and their collective or singular relationship to the environment. Parallel to the work of Thompson on interdependence are his thoughts on coordination. There are three categories.[4]

Coordination by Standardization: involves the formulation of routines and rules which constrain the action of subsystems in their interdependence with other subsystems. Standardization can apply in situations which are relatively certain, predictable, and stable. Where situations are infrequent enough to allow the application of rules, where behavior can be specified.

Figure 2.2

MANAGEMENT SUB-SUBSYSTEM FUNCTIONS

CHARACTERISTICS	OPERATIONAL CONTROL	MANAGEMENT CONTROL	STRATEGIC PLANNING LEVEL
Responsibility	Specific	Conditional	General
Authority	Defined	Discretionary	Comprehensive
Coordinating Procedures	Mutual Adjustment Standard/ Plans	Standards Plans/Schedules	Standards
Environment Interaction	Independent	Selective	Boundary Definition Strategy Selection
System Strategy	Closed	Closed/open	Open
Interdependencies	Reciprocal	Sequential	Pooled
Information	Utilized/ Initiated	Interpreted/ Disseminated	Formulated/ Initiated
Uncertainty	Contingency Isolated	Contingency Potential	Contingency Guaranteed
Decision-Making	Routine	Routine/ Programmed	Unprogrammed
Conflict Resolution	Negotiation	Mediation	Negotiation
Leadership	Emergent	Selected	Predetermined
Infrastructure Development	Variable	Transitional	Stable
Technical Development	Extensive	Selective	Cursory
Power Distribution	Diffused	Directed	Concentrated
Fiancial Control	Restricted	Measured	Consummate
Input/Output	Produces	Evaluates	Adopts

Coordination by Plan: proposes establishing schedules for subsystems to govern their actions. Coordination by plan does not require the same stability and certainty as standardization. It can operate in changing situations, especially those where the environment impinges upon the organization.

Coordination by Mutual Adjustment: involves the transfer of new inputs while coordination is in progress. It is the process of informal, face to face communication. The more variable, the more uncertain; the more unpredictable a situation, the greater the dependence upon mutual adjustment as a coordinating mechanism.

Corresponding relationships exist between interdependencies and coordinating devices. Pooled interdependence is coordinated by rules, standards, and routine predictable processes. Resource cost for communication and decision making is relatively low. Sequential interdependence is coordinated by plans and schedules; "cost" is moderate. Reciprocal interdependence is coordinated by mutual adjustment; the most expensive type of coordination in terms of information and communication flow and decision making effort required.

The coordinated action of interdependent elements makes it possible for the organization to achieve objectives. This internal differentiated activity and patterning of relationships is actually the structure of the organization. It is the task of structure to facilitate the coordinating process. Actual structural configurations are determined by the nature of the coordinating process and the organizational environment.

STRUCTURAL SUBSYSTEMS. Structural relationships define the methodology whereby the objectives of the organization are implemented. They establish patterns of authority, communication and information flow, and a systematic and coordinated division of responsibilty for the completion of tasks. As an open system the internal structuring of an organization is directly related to the environment. As the environment becomes more heterogeneous, dynamic, and uncertain, the organization structure must also become more highly differentiated, complex and organic. In a stable environment, positions are static and structuring is hierarchical and mechanistic.

Thompson has advanced the notion that the structure of organizations must be developed

and maintained consistent with "performance" requirements and the realities of the task environment. He suggests that the central problem of organizations is dealing with uncertainty; that the organization can be structured to cope with it. Further, that the differences in organizations will be a result of varying performance requirements and task environments. While the constraints of performance and environment differentiate organizations, they do so within an evolutionary context.

There are three basic configurations of organization structure. Either they exist alone or, more often, they overlap. The oldest is the hierarchical or bureaucratic/classical model. More recently the project model and matrix model were developed to meet the demands of growth, complexity, and change.[5]

HIERARCHICAL MODEL. This is perhaps the most commonly perceived pattern. Its earliest references are church and military designs. More recently it has been influenced by Weber's (1920's) theories which emphasize specialization, hierarchy, rules, and impersonal relationships. Its characteristic shape is a pyramid with the planning level at the top, with management in the middle, and the operational level at the bottom. The organization is usually divided into various specialized functional groupings at the managerial level. These functional sub-units are staffed according to a particular discipline for maximum technical efficiency. Herein lies the strength of the hierarchical organization; pooled resources, physical proximity, rules and standards to govern activity, a defined vertical communication process, and an environment of certainty at the performance level. If these are the strengths of the hierarchical organization, they are also its weaknesses. When participating in multiple projects, conflicts arise over priorities in competition for resources, rules become ends in themselves impeding goal attainment, lines of communication become lengthened, and the functional department places more emphasis on its own specialty than on project objectives. In spite of these dysfunctions, the hierarchical configuration persists, and can be expanded to meet specific needs. See Figure 2.3a.

The hierarchical model can realistically meet the needs of a limited number of development programs. The project environment

must be static, homogeneous, and stable for efficient control by a centralized authority.

PROJECT MODEL. This structural design was devised to focus talent and resources for a given period on a specific project objective. Project organizations are separated from the regular functional structure; however, its internal structure is functional. The project team consists of specialized units. The project manager is given autonomy over the support staff for the duration of the project. Its biggest asset is a well-defined single objective under a unified command. Where informal communication is characterized by greater flexibility of horizontal, relationships which hasten the decision-making process.

The project organization is not without drawbacks. Its tenure is for a limited duration; its dynamic effect can be upsetting to the regular functional groupings. Personnel assigned to a temporary organization can lose "status" in their functional home in the parent organization. Also, the success of project organizations is dependent upon leadership. The project manager becomes oriented to management of human and non-human resources and away from a functional role. The forces acting upon the project are complex and dynamic. The uncertainties are extensive. See Figure 2.3b.

A project model has applicability over a wider range of development projects than the functional model by virtue of its decentralization and project orientation. Both the hierarchical model and the project model are limited by their inability to act in a multidimensional way in conditions of uncertainty. They lack the capability to maintain the necessary balance between the technical expertise of the functional departments and the short term objectives of the project.

MATRIX MODEL. The matrix organization is one which capitalizes upon the strength of the hierarchical and project organizations by superimposing one over the other. It combines the standard vertical structure of the hierarchical model with the lateral structure of the project model. The matrix is able to achieve coordination across functional lines where functional department heads have authority and project objectives and where the project manager is responsible. As might be expected, the functional aspect of the vertical

hierarchical organization and the horizontal project team is faced with a deliberately introduced conflict which requires constant negotiation between function and project. The duality of this problem is a perennial dilemma. The resolution is contingent upon a specific instance where authority and responsibility of the project and specialized units are more clearly focused. The matrix model is complex and requires rather open attitudes and behaviors to achieve flexibility. See Figure 2.4

A matrix structure in an urban development context allows decision making capability to be delegated to the operational level where coordination of interdependent tasks is actually taking place. Final control of decision making can still rest with the management or planning level.

No single type of organizational structure has universal applicability. Increasingly, where consideration of human factors at the individual and institutional levels is required, a form of matrix design is desirable. However, the duality of authority and responsibility caused by the juxtaposition of hierarchical and project organizations requires constant effort and relies heavily upon the

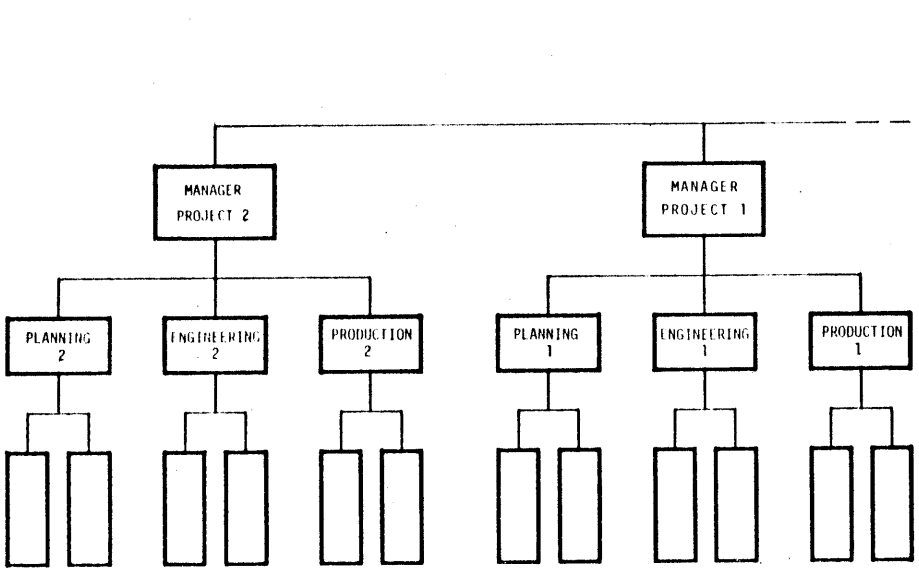


Figure 2.3b PROJECT MODEL

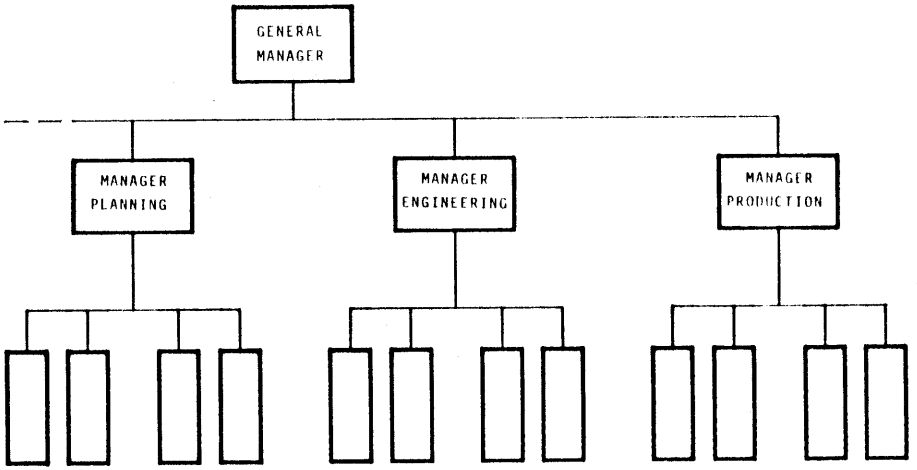


Figure 2.3a HIERARCHICAL MODEL

the interpersonal skill of the project coordinator.

Each type of structure, hierarchical, project, or the various forms of matrix is better or less suited depending upon particular needs. Ultimately consideration must be given to performance requirements, organizational goals, and a specific project environment. It is possible to guide the selection of structure by deciding upon the criteria most appropriate for a design and assessing them against possible structure types. See Figure 2.5. This particular evaluation has a behavioral bias, and therefore, the matrix structure appears to be most advantageous. In any case, organizational structures are constantly evolving. Environmental forces require that organizations constantly adjust to change for their perpetuation and survival. The organic organization is less rigidly structured than the mechanistic organization and therefore more adaptive and flexible. There are, however, organizations which operate in stable environments or require stability to complete their objectives. In these cases a mechanistic structure is more appropriate.

SUMMARY. Organizations, to accomplish their objectives, integrate their activities by establishing interdependent subsystems whose efforts are coordinated to be consistent with the goals of the organization. Two such systems are the managerial and the structural subsystems. The managerial subsystem further subdivides into specialized departments which plan, manage, and operate the tasks of the organization consistent with performance requirements and environmental influence.

The pattern of interrelationships between the various components of the organization is its structure, or structural subsystem. The

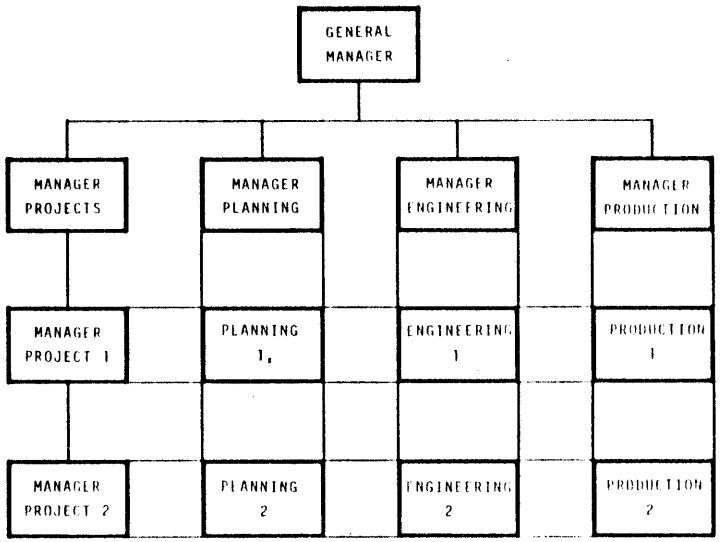


Figure 2.4 MATRIX MODEL

behavior of the organization can also be influenced by its structural subsystem. There are three principal structural configurations: hierarchical, project, and matrix. Their application depends upon specific conditions of environmental influence and task requirements. They are not "pure" types, because organizations contain all three simultaneously; however, one may predominate. Changing, complex, and dynamic environments require organic and flexible organizational structures which are able to coordinate the activities of interdependent units. Mechanistic and permanently structured organizations can operate in a static and stable environment; however, they become dysfunctional when they are unable to adjust to complexity and change.

The environments and the needs of urban development programs rarely remain static. Complexity increases constantly. Greater flexibility is required on the part of planning/implementing organizations to decentralize their operations to insure completion of and responsiveness to programs. Greater differentiation of tasks is necessary to take advantage of specialization, of greater speed in decision-making from delegated authority, and

Figure 2.5

CRITERIA FOR GUIDING THE SELECTIONS OF AN ORGANIZATION DESIGN

ENVIRONMENTAL FACTORS	HIERARCHICAL	PROJECT	MATRIX
(BEHAVIORAL BIAS	+2+1 0 -1-2	+2+1 0 -1-2	+2+1 0 -1-2
Exernal Change	-1	-1	+1
Tolerance for Ambiguity	-1	0	+2
Uncertainty	-1	0	+2
Internal Change	-1	0	+1
Efficient Resource Use	+2	+2	-2
Undefined Performance Standards	-1	-1	0
Undeveloped Management Infrastructure	-1	-1	+1
Shifting Power Center	-2	-1	+1
Maximum Performer Participation	-2	0	+2
Human Factor Optimization	-2	0	+2
Undeveloped Technical Resources	-1	-1	+1
Alignment to Flow	-2	-1	+2
Critical Time Flow	+1	+2	-1
TOTAL	-12	-2	+11

Note:
Each structural type is weighted according to its advantages (+) and disadvantages (-) from +2 to -2. The environmental factors are evaluated and assigned a numerical value for each structural type. The total is the arithmetic sum of advantages and disadvantages.

of greater motivation which can accrue from a broader base of participation.

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III. ORGANIZATIONAL ALIGNMENTS FOR URBAN DEVELOPMENT

ABSTRACT. An urban organization as an open system depends upon a state of equilibrium for its continued functioning. The system becomes dysfunctional when its balance is lost. For an organization to function, all parts of the system must be equally potent. Usually urban development efforts have often been unilateral and have been forced to function within a closed hierarchical top-down system. A bottom-up development strategy is dysfunctional because it lacks the resources to achieve a 'steady-state'. An adaptive development strategy is proposed which mediates the activities of interdependent segments of an organization.

Organizations are open systems which are in continuing interaction with the environment. To accomplish their objectives, organizations form interdependent subsystems whose activities are coordinated for a concerted effort. Organizations structure themselves depending upon their performance requirements and their environmental relationships. The underlying consideration of these precepts is the existence of a synergestic continuum which requires inputs, makes transformations, and issues outputs which in turn promote new inputs. The 'system' subdivides, expands, contracts as the forces acting upon it require. One feature remains constant: the existence of a dynamic equilibrium which allows the system to perpetuate itself, a 'steady-state' which sustains the capacity to accomplish work and transform energy.[1] For the forces which act upon the system to be harmoniously balanced, they must be resisted by an equally potent opposite force. Otherwise, the system becomes unbalanced and dysfunctional. If the subsystems of an organization are not interdependent and their efforts are not coordinated, one part of the system dominates the others. If the patterns of relationships between various departments of the organization are monopolized on the basis of power and authority rather than a coordinated effort, the dominated segments become indifferent and inert. In this same way, development programs are handicapped by a lack of integrated effort by systems which are out of balance, by systems which

tend to make the means of development the end in itself.

Relatively few urban development efforts in the developing countries are successful because they are fragmented and lack co-alignment with the 'environmental flow'. Even when efforts are part of a macro-system or sector strategy, they are incapable of having a significant impact on project development. A passive behavioral relationship exists between development programs and administrative procedure. The planning and implementation of projects follows the functioning of the predominant institutional patterns rather than the actual program needs.[2] All too often the entire development process becomes muddled: emphasis is upon rules and procedures, bureaucratic haggling makes integrative mechanisms inoperative, goals become confused, the strategy of long-range development is lost. The over-riding concern has been on the operation of the system rather than making the system operate to achieve objectives. Despite considerable experience, lending institutions and aid recipients find there are serious defects in project planning and implementation mechanisms where the specter of past failures haunts each prospective undertaking.

The usual approach in addressing development is based upon the political authority of the national power structure in recipient countries. In most cases these designs are monolithic, intrenched, and inflexible. The status-quo is maintained by a small elite whose power is consummate. Development from a 'grass roots' level is also possible and indeed desirable, but not without significant drawbacks. Miller noted in his rural development experiences in Mexico that two forces were in operation, seldom in pure form, one from the top-down and the other from the bottom-up.[3] In urban development the distinctions are similar.

TOP-DOWN DEVELOPMENT. In the period following World War II, economic development became the major strategy to improve the conditions of life for the poor. Its aim was to raise the gross national product of developing countries by stressing the creation of employment. By building up the capital infrastructure and productive capacity

of the economy, it was theorized that subsequent economic growth would 'trickle-down' to the poor. Planning projects were based upon low-risk investments in technology. Problems were interpreted in terms of national production goals for the achievement of economic growth. The national plan assumed that its economic goals were substantially consistent with local needs.

Administration of these programs was based upon the current and continuing U.S. practices. The hierarchical/bureaucratic organization is in operation. Experts in distant capitols formulate rules which are transmitted to local institutions without their participation. Planning is separated from implementation and does not include a realistic assessment of local needs. These rules are administered by agencies which find it easier to compete than to cooperate. The hierarchy has a downward emphasis. Local input and initiative are blocked. Rules and procedures become ends in themselves with resulting disruption of goal attainment. A structure that was intended to promote maximum efficiency accedes to detrimental conflict. Bureaucratic specialists perpetuate a closed system which ignores the environment, cannot accept change, and stifles creative human activity by making it part of a national sub-system which exists for its own sake. Institutional forces dictate goals to be achieved and procedures to be followed. Performance is based upon the functioning of the system instead of the achievement of results. Unilateral planning is dictated to the poor, who lack a power base to propose initiatives of their own. The top-down system continues until the inequities become too great and the forces of change cannot be contained. Lacking an interdependent coordinated effort the system breaks down.

BOTTOM-UP DEVELOPMENT. Until the advent of mass communication, the poor yielded to their station in life. Because they have been without access to adequate health facilities, education, nutrition, and shelter, they have been trapped in a cycle that has left them impassive, subservient, and immobilized without options. Slowly they have come to realize that their condition is not one caused by inherent inferiority but one

caused by a system which does not allow them to take part in the planning of their destiny. Historic resignation is being supplanted by a new awareness which demands equity and participation not as a dole from a generous paternal benefactor but as a fundamental right. At such a juncture bottom-up development becomes one of the oppressed against the oppressor, the exploited against the exploiters. Against a backdrop of poverty, unemployment, inflation, and corruption, the sparks of discontent ignite violence. "While revolution is an explainable response from desperate people fighting for their freedom, it solves nothing."[4]

Not having an organized constituency, the poor are shunted from one power base to another. Without leadership, knowledge, and organization, they cannot establish the capacity to influence events on their own behalf. The poor struggle at subsistence level. Their priorities are focused primarily upon their physiological needs. They are dominated by their physical and socio-economic environment. Their efforts to force initiatives from the local level are frustrated by the lack of concerted cohesive action. They cannot exert sustained influence on the issues that dominate their lives without effective organizational capability.

Both the top-down and bottom-up development strategies have productive attributes to recommend them. The conflicts caused by enforced bureaucratic compliance in the former and the desire for participation of the latter can be channelled productively. An organization confronted with 'variable-rich' phenomena requires a strategy which can simplify and make manageable complex circumstances. It must set boundaries for satisfactory accomplishment within the environmental flow.

ADAPTIVE DEVELOPMENT. Development programs are dependent upon the capability of the urban poor to organize themselves into cohesive, self-sustaining units and to exhibit greater local autonomy in the decision-making which affects their lives. As individuals they are without options. As a collective entity they are better able to mobilize themselves to expand their

choices, to become cognizant of new opportunities, and to expand belief in themselves and their ability to bring about changes. As a group they enhance their capability of solving many of their own problems and of becoming an organized constituency which can propose initiatives in their own interest. Community groups at a local level, because they lack knowledge and resources, are incapable of completely administering programs as an independent entity. They must become part of a larger organization system composed of interdependent relationships to achieve objectives and to establish a means for adjusting to environmental changes on a continuing basis.

Miller defined the process of underdevelopment as the relative lack of control over relations with one's environment, which includes both the local physical environment and the external environment that comprises the wider socio-economic political system.[5] Development, then, implies a change in such relationships in the direction of influencing and controlling the environment instead of being by it. A change from impotence toward potency. The primary task of development programs is to help the urban poor to establish a posture for increasing their control over the environment.

Urban development environment is complex and constantly changing. The individual urban dweller, to establish himself in a sustained productive way, must develop the ability to cope with uncertainty. He must become part of a collective entity through which his individual effort can be extended. Through organized effort the poor can structure and integrate their activities to set limits on environmental uncertainty.

As we have discussed previously, the organization is composed of subsystems whose function it is to departmentalize tasks in order to take advantage of the benefits that accrue from specialization. Each segment, then, is part of a broad system whose entire effort can be brought to bear on the problems of development. Each subsystem and sub-subsystem consists of interdependent elements whose efforts are coordinated in concerted effort to

achieve objectives.

The local community level is where the work of the organization is carried out. Local groups perform the function of the operational control sub-subsystem. According to this concept, protection from the environment is required to allow routinized, standardized tasks to be accomplished. These tasks are the essence of urban programs; they fulfill the basic needs of the poor. Within the context of the operational control level, physical improvements can be made, education is accessible, and health and nutritional information can be disseminated. In conditions where uncertainty is minimized, transformations are possible which promote outputs and additional inputs. Within this kind of context the work of the organization can be accomplished and results can be achieved.

The concept of interdependence suggests that urban development activity must be conceived of as part of a broad system composed of numerous subsystems, wherein each element can coordinate its activity to achieve objectives. The relationship between elements must be established and processes which coordinate their interdependence must be defined.

Conceptually the work of the operational control sub-subsystem is mediated with that of strategic planning sub-subsystem. In the same way activity of local groups must be mediated with an organizational segment which can perform boundary-spanning functions with the environment. This function is carried out in most cases by a national entity. The strategic planning level defines the role of the organization in the environment. Previously, this function has been performed in a unilateral way with little or no participation from the local level. What is suggested is that the planning level perform its tasks with the 'advise and consent' of the implementation (operational) level. And further, for this activity to be productive and to achieve goals, the operational level must be a potent force capable of integrating its needs into a development effort.

The ramifications of this type of interrelationship are far-reaching. A reorientation of political structure and changes

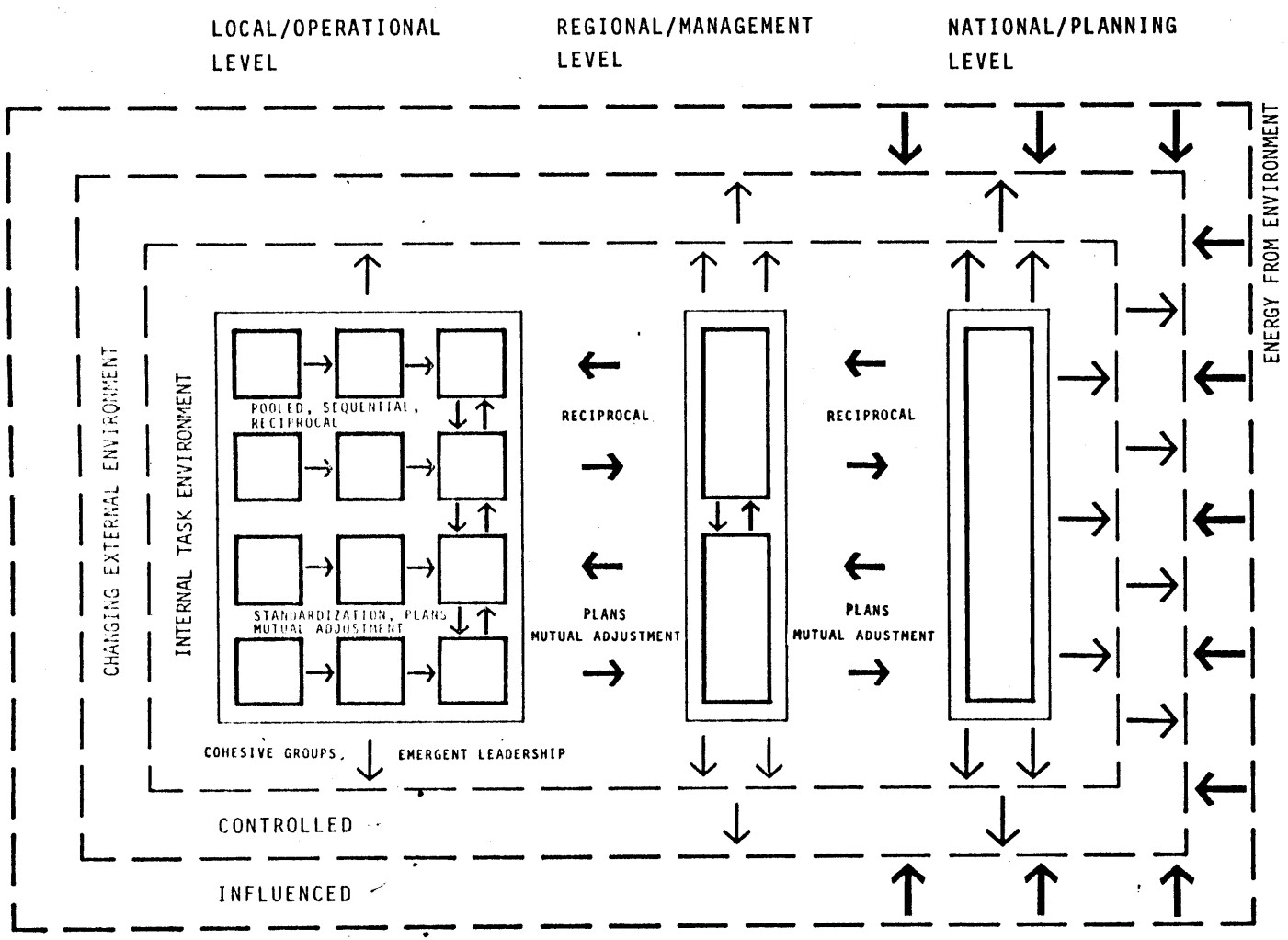
in other cultural institutions are required. As Korten suggests, empirical evidence demonstrates a need for strong semi-autonomous organizations at local level which can stimulate participation together with the formation of horizontal and vertical networks of interdependent organizations which make development more than just an isolated localized phenomena.[6]

Figure 3.1 outlines an adaptive development strategy as an open system. The parts of the system are defined into local, regional and national entities. Interdependencies between the parts is suggested as being reciprocal to maintain maximum communication for dissemination of knowledge and information. Development environment is turbulent and uncertain, contingency is guaranteed, decision-making requires fluid information flow. To maximize interdependent effort, coordination is proposed through mutual adjustment, face to face contact. The actual mechanisms can be committees, task forces, and neighborhood councils which depend heavily upon interpersonal contact. The boundary-spanning role of the system with the environment is performed at the strategic planning level with three levels of environmental interaction: control, influence, and appreciation.

The structure of the system is a matrix type organization which emphasizes the openness of the system and its ability to react to the environment. An adaptive system is differentiated to cope with a heterogeneous environment. Relationships are structured and integrated not in a bureaucratic/hierarchical vertical manner, but horizontally in such a way that an equilibrium exists between the different parts of the system. The operational level of the system is protected from the environment. The system is indeterminate and faces uncertainty, but at the same time to perform work, it is "subject to the criteria of rationality needing determinateness and certainty."

As an open system, the adaptive development strategy strives for survival, receiving inputs from the environment, making transformations, and issuing outputs to the environment to promote further inputs. The system is significant not only for the

Figure 3.1 URBAN ORGANIZATIONAL SYSTEM/ADAPTIVE DEVELOPMENT



inputs which it delivers to the project environment, but also, perhaps more important, is the evolutionary cycle which it initiates and the contributions which it makes toward changing traditional social relationships, equalizing power relationships, and building potent local organizations.[7]

An adaptive system can help the urban poor to discover the possibilities of exercising autonomy and choice. It can help them to foster the capability of managing their affairs in a self-sustaining process of development. Before an adaptive system can effectively operate on behalf of the poor, they must establish a cohesive entity which can represent their interests. A system which will allow leaders to emerge into positions of responsibility; one which will allow communication to flow between leaders and their wishes. The urban poor must establish a power center which can contend on their behalf; one that can extend their individual rationality to concerted action. They must organize themselves into groups.

SUMMARY. A productive urban development organization depends upon a dynamic equilibrium between interdependent parts. Traditional top-down strategy has not achieved desired results because development is tied to the operation of the system rather than the achievement of results. Bottom-up strategy is limited by its inaccessibility to resources and the imbalance of existing power relationships. An adaptive development strategy subdivides the organization into interdependent segments whose efforts are coordinated to achieve objectives and to adapt to the uncertainty of the environment. This strategy proposes to perform tasks in an atmosphere protected from the environment by collective entities which have potency to propose initiatives on their own behalf.

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IV. GROUPS, PRIMARY COMPONENTS OF URBAN ORGANIZATION SYSTEMS

ABSTRACT. Groups are the fundamental social unit; as such, they are an integral part of the organizational system which emphasizes the importance of interpersonal relationships. Groups are generally structured in two ways, formally and informally. The definition and ordering principles of relationships within groups are norms and roles. A systematic continuum is responsible for the synergistic behavior of group interactions. These uniformities are applicable not only to groups, but also to other social systems.

By establishing themselves into groups, urban migrants can help themselves to bridge the gap between their former condition and the creation of a position of potency from which they can effectively increase control over their new environment.

Systems imply interrelatedness of internal segments to a whole in a continual interaction with an external environment. The internal segments are positioned to interact with some minor environment and the whole with a major environment. Conceptually, systems exist in macrocosm and microcosm. Similarly, organizations as open systems are composed of different hierarchical levels; the interrelatedness and interdependence of action between components at each level is guided by similar principles. Organizations and their subsystems are in dynamic equilibrium, in a constant state of modification and adjustment with the environment, changing it and being changed by it. Urban development organizations usually exist as part of a national system which is further sub-divided into regional and local systems. At the local level, the primary social subsystem is the group.

The concept of the group was defined in its commonly accepted terms by Cooley in 1909. He defined the primary group as one characterized by intimate face-to-face association and cooperation. Groups are composite unities which can accommodate self-assertion when it becomes socialized by sympathy and purpose.[1] Cooley further described groups as being dependent upon a larger society and in many respects

reflecting its spirit. Groups are the source of life, not only for the individual, but also for institutions as well. Further, he postulated that human nature is a vital component of all primary groups, and human nature, because it is essentially universal, forms a bond between all primary groups and unifies them as generally the same for all societies. In this essential congruity of small groups is to be found the similar ideas and sentiments of mankind. These attributes of human nature are acquired and are fostered through fellowship and interaction; in isolation, they atrophy and die. This empathetic interaction present at group level makes complexity and environmental influence manageable. In groups, the forces which act upon the system are least. In such a situation behavioral judgments within bounded rationality are possible. Considerable investigation has emphasized the importance of the group upon individual behavior irrespective of environmental constraints. The group is the common social unit, the mediating element between the individual and the organization.

There is a variety of group types, each with different characteristics. All groups, however, can be categorized into two general classifications: informal groups and formal groups.

Informal groups are formed by common interests, attitudes and friendships. They arise spontaneously from the activities and interactions of group members. Informal groups satisfy the intense social need of most people, the need for affiliation. Ordinarily, the continued membership in an informal group is based upon a positive posture within the 'exchange theory', that is, the rewards of group membership outweigh the cost.

Formal Groups are usually constituted by specific mandate. The membership and structure of such a group are formally determined in a deliberate attempt to establish interactions for the achievement of goals. A leader is granted authority over the other members. Duties, functions, and responsibilities are prescribed.

The selection of an informal or formal structure is not an 'either-or' situation. They can and, in most cases, do co-exist.

It is important to point out that, owing to reduced role definition, informal groups can be disruptive. Conflicting goals, disagreement over task priority, conformity, blocking of personal ambition, and diffused authority are among the factors which diminish the effectiveness of informal structures.

Within informal groups the units of analysis are norms and roles. Norms are the paradigms of acceptable behavior (i.e., authority relationships, personal obligations, rights, etc.). Norms are the duties and moral obligations which group members adopt as just, proper, or ideal. Roles are the designations that have expectations of evolving from established norms. They define how a person should perform in a given situation. Norms and roles are the cultural tools for analyzing informal group behavior which can have universal applicability. Within formal groups, norms and roles are predetermined. The relationships between individuals are spelled out specifically toward the achievement of objectives. The element of time marks a distinction between formal and informal groups in that the interactions of formal groups can be readily mandated within time constraints. Informal groups, on the other hand, establish relationships through continually evolving interpersonal initiatives and responses independent of time priorities. The patterns of all group behavior are dependent upon internal processes, external relationships, and upon the forces which guided their formation.

The most basic concept for group formation is 'propinquity'. Propinquity means that individuals affiliate with one another because of spatial or geographical proximity. People are more likely to form groups if their activities are close to one another. While physical proximity is valid as a first-cause hypothesis, it fails to take into account the network of behavorial considerations which effect group formation.

Homans developed a more comprehensive model for social systems that can serve as a basis for evaluating groups as well as organizations.[2] Homans' effort was based upon the intensive and systematic examination of five small groups. On the basis of these studies, he theorized that there

are interconnected uniformities which can be detected in the behavior of persons in groups. He proceeded on the assumption that the workings of particular groups can be translated into a better understanding of groups in general. Further, the inference can be made that these uniformities which appear in small groups can also characterize larger units of society as well.

Homans viewed groups and organizations as an internal system of relationships within an environment. The internal relationship stresses three elements of interdependent behavior: (1) activity, what members do as part of a group; (2) interaction, the relationship which the activity of one member of the group has to that of another; and (3) sentiment, the sum of interior feelings that a group member has in relation to what the group does. Working through these concepts, he examines the impact of the internal and external environment. Homans was able to conclude that within the context of the five groups studied each concept acted the same way to perform the same functions. He stated that these forces which affect behavior are in a constant state of mutual dependence. For example: the more activities members share, the more numerous will be their interactions and the stronger will be their sentiments; and the more sentiments members have for one another, the more will be their shared activities and interactions; and the more interactions between members, the more will be their shared sentiments and activities. These relationships are part of a continuum so long as a condition of equilibrium exists and the elements of behavior remain mutually interdependent.

INPUT	THROUGHPUT	OUTPUT
Activities	Interactions	Sentiments
Sentiments	Activities	Interactions
Interactions	Sentiments	Activities

If activities, interaction, and sentiments are related in a positive sense, the

opposite is also true. One of the cases which Homans studied was Hilltown, a disintegrating New England town. Instead of inquiring simply how interaction and activity are related, he observed the consequences as the activities of a group decrease in number. Hilltown had seen its industries move elsewhere; as the activities which the townspeople performed in the pursuit of their employment decreased in number, their interaction necessarily decreased. As the frequency of social interaction decreased, the norms of the town became less well defined and less strongly held. Since social rank is determined by the degree to which a man lives up to the norms, social rank also became less firmly established. From these changes Homans suggests that, "as the group has fewer incentives to offer individuals for compliance with its norms and fewer punishments to impose for disobedience, anomie or disintegration results."[3]

What becomes apparent in Homans' analysis is the importance of total interrelatedness of the group as part of an interconnected whole indexed to human behavior at an intimate level. Moreover, this system of dependent relationships reacts with the environment, changing and being changed by it; constantly adjusting and re-adjusting to commonly accepted goals; striving for equilibrium. "What acts and what reacts, is not a single part of function of the system, not any combination of parts or functions of the social system, but the system as a whole, a totality whose mutual interdependence <u>is</u> the system."[4]

URBAN GROUP DYNAMICS. Given sufficient time, natural evolution occurs which makes group cohesion possible. However, during rapid technical change, economic expansion, urbanization, or similar upheaval, groups disintegrate and they are not readily replaced with similar social units which can provide emotional sustenance to individuals. Such is the case with the newly arrived urban immigrant. He has left an environment where, as a valued member, he was shielded from adversity by highly personal relationships of mutual exchange and reciprocity. From an environment where adjustments have been gradual and tested by time; where

cultural practices and rituals are aligned with biological make-up, the urban migrant enters the urban milieu completely unprepared. With his familiar references removed, he is alone. How then does he cope? The fortunate can depend upon extended family ties until they are able to become acclimated. Usually they become engaged in an extended process of moving back and forth between the urban and rural areas. Many, however, cannot make the transition on any terms. There are the disenchanted who return to their village and there are the destitute who cling to the edges of urban squalor to exist in desperation all their lives. Unless the migrant establishes new relationships which facilitate his adjustment, it is likely he will become the victim of those behavioral determinants which promote his isolation. In the case of most urban migrants, choices are extremely limited. They are part of an influx that is expanding at a rate greater than urban areas can absorb. Already in most developing countries, vast urban areas are overrun with illegal or squatter settlements. Here the inhabitants exist without adequate water supplies, sanitation, medical care, education, and other social services. These squatter settlements grow without any particular order and reflect the state of chaos which governs the lives of their inhabitants. Because their activities are uncoordinated, lack coherence, and are not an interdependent part of an organization system, squatter settlements are left to stagnate. Here people will live at subsistence level, perhaps for generations, perpetuating the poverty cycle, unless the efforts of these urban poor can be organized and they can assume a posture of potency.

Potency by its very nature implies permanence. Usually informal group formations as a means of need fulfillment for the urban dweller are based upon issues which are fleeting and easily manipulated to serve the needs of those in power, at both the local and national levels. The inability of the urban poor to form self-sustaining groups stems from the absence of a cohering force. For the most part their only link is abject poverty which keeps them prostrate. Their condition determines

their behavior and continually reinforces their isolation.

If negative behavior can be attributed to the lack of potent interdependence, the inability to predict and influence human activity in a productive way, perhaps the opposite is also true. Positive group formation in a physical sense could supply sufficient catalytic action to generate productive activity and interaction for individuals to weld themselves into an operation of some potency. Through physical planning it is possible to construct formal groups in which human activity and interaction can be guided. Formal groups administered in an informal, organic way can provide order to a chaotic situation. Once interrelatedness and interdependence are established, the seeds for a systematic effort will have been sown. With enlightened organizational assistance, the urban poor organized by small group action can transform their relationship to the environment into one of greater influence and control.

SUMMARY. Group interaction is a characteristic of a system which exists both in macrocosm and in microcosm. It stresses face-to-face relationships and interdependence among individuals. Groups are the fundamental social unit of society; their characteristics have universal applicability. Informal and formal structures are the two most common group classifications. The units of analysis within groups are norms and roles. The conceptual model which designates group behavior in terms of activities, interactions, and sentiments emphasizes the interelatedness of these activities with a cohesive system.

Urban migrants who were once part of established groups, become isolated. Unless they can form new relationships in the urban environment, they cannot survive. Positive group formation, to enhance the potency of the urban migrant, can possibly be established through comprehensive physical planning.

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V. URBAN LAYOUTS

ABSTRACT. Urban layouts are systems of interdependent elements which interact with the environment. They determine physical patterns which influence human behavior, namely configurations can be designed which enhance group interaction. Urban layouts are articulated by the systems of circulation, vehicular and pedestrian. Two systems of circulation, lines of circulation, and lines of access, determine block layouts, gridiron blocks, and grid (cluster) blocks. Block layouts, in turn, determine the flow of traffic, the patterns of land subdivision, the distribution networks for utilities, and the type of social structure which will evolve from alternative layouts. Grid (cluster) blocks, because they promote positive group formation, are more conducive, ultimately, to the interrelated, cooperative social enterprise.

In the same way that systems concepts establish an orderly basis for understanding organizations, they provide an equally valid conceptual arrangement for the methodical consideration of urban layouts. A systems approach provides an integrative framework for considering urban layouts as a system interacting with its environment. Physical layouts, like social organizations, are human constructions. They are composed of interdependent and coordinated subsystems. As in the case of organization design, the pattern of relationships of different subsystems determines the structure of a physical layout. Perhaps the most important distinction in the conceptual comparison between organizations and physical layouts is their ability to adapt and to evolve as the environment changes. An organization by its very nature is an open system of interdependent subsystems that adjust and re-adjusts to accomplish its objectives. Physical layouts on the other hand, once implemented, become fixed, closed systems can be transformed only with considerable expenditure of resources. Physical layouts, after their translation from meta-physical conceptions to semi-permanent elements in the environment, become a determinative phenomenon.

For our purposes, these ideas regarding urban layout systems are significant insofar as they define the relationships which guide the formation of groups. The conceptual outline from which these relationships are taken

is the work of Caminos and Goethert.[1] It emphasizes the importance of layouts which optimize land utilization and circulation.

All urban plans are primarily a function of a circulation system. The circulation system is the generator. It establishes the interdependent relationships which exist between all elements of the physical plan. It determines the flow of pedestrian and vehicular traffic. Because circulation occurs on public land, it also determines the patterns of land utilization, the subdivision of land into blocks and lots, and the distribution network systems for utilities, water supply, sewage disposal, street paving, storm drainage, electricity, and street lighting.

Urban layouts are primarily a function of two types of circulation; lines of circulation and lines of access. The distinction between these two systems determines use, control of space, and block layout. If streets are primarily for unlimited public use to promote general circulation, they are lines of circulation. Control is by the public sector. When streets have particular use and are limited to a specific constituency, they are lines of access. Control is by the private sector. The block is the characteristic element of urban layouts. It is defined as a portion of land containing two or more lots bounded and served by lines of circulation. There are two basic types: gridiron blocks and grid blocks.

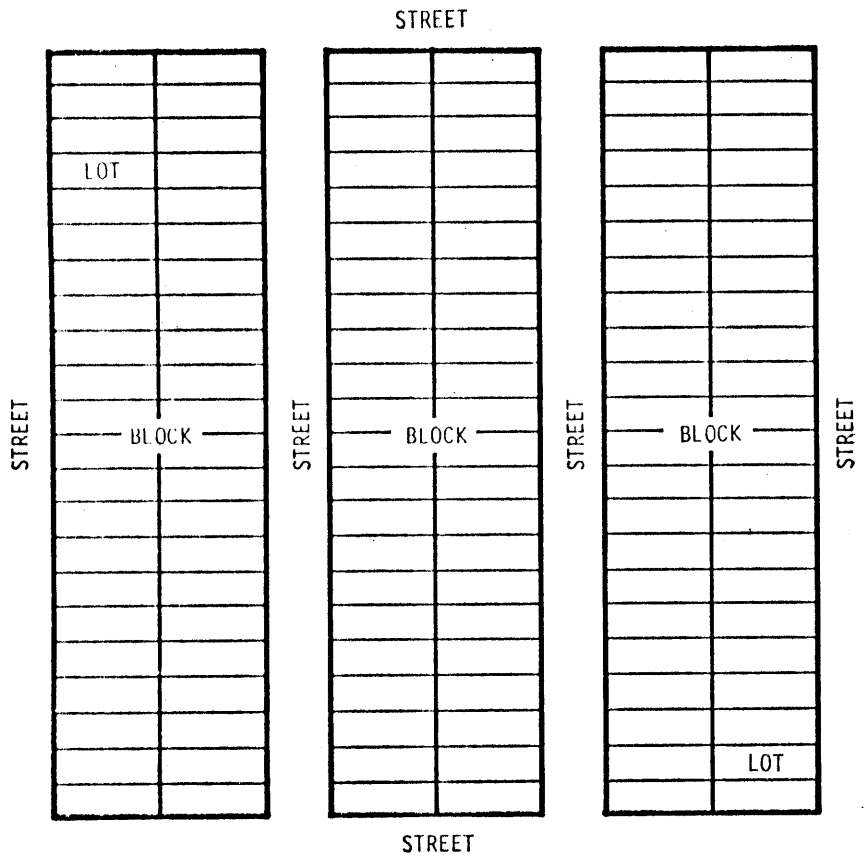
GRIDIRON BLOCKS. These are blocks where the distances or intervals between lines of circulation and boundaries are determined by the dimensions of the lots because they do not have lines of access.

GRID BLOCKS. These are blocks in which the distances or intervals between lines of circulation and boundaries are independent of the dimensions of the lots because the lots do have lines of access.

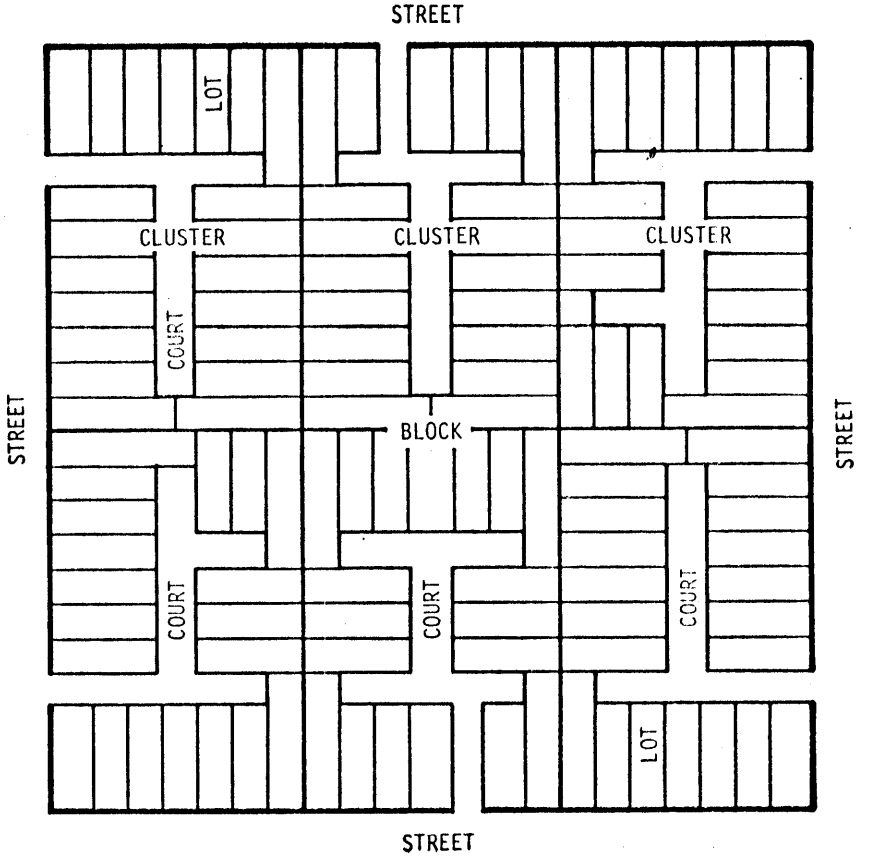
Both urban layouts are schematically represented in Figure 5.1. Their basic components are: STREETS (lines of circulation), the public land for circulation of pedestrians and vehicles; BLOCKS, a portion of land enclosed and served by public streets, which contain one or more lots; CLUSTER, the shared ownership of land by a group; COURT (line of access), the semi-public land for limited access to lots; LOTS, the measured parcels of land having fixed boundaries and access to

Figure 5.1 GRIDIRON BLOCKS/GRID BLOCKS

INDIVIDUAL LOTS
GRIDIRON BLOCKS
DIAGRAM



CLUSTER LOTS
GRID BLOCK
DIAGRAM



COMPARISON OF URBAN LAYOUTS

CHARACTERISTICS	GRIDIRON BLOCKS INDIVIDUAL LOTS	GRID BLOCKS CLUSTER LOTS
Street Layout	Determined by lot sizes.	Determined by convenience of circulation.
Street Length	Precludes minimization	Permits minimization
Utility Networks	Precludes minimization	Permits minimization, on-site sewage treatment possible
Social/ Political	Lots/Dwellings are in front of a public street that serves as access as well as for through circulation for anybody; pedestrians, vehicles or both. This impedes the utilization of the space by the neighbors for other functions.	Lots/Dwellings are grouped around a semi-private common court that serves as access to the dwellings as well as for multiple use by their occupants: social activities, children's playground, laundry area, parking, etc.
	The street is a no-man's land, for the use of everybody, with no controls and nobody responsible.	The court is held in condominium by the dwellers, who share its use, control, and responsibility.
	Does not lend itself to group formation.	Social system established. Creates cohering group relationships.
		Encourages popular initiative, responsibility, participation.
	Group initiatives based upon issues which are transient, consensus difficult to establish on a continuing basis.	Permanent group structure encourages activities, interacting, and sentiments. Established base for on-going popular initiative. Creates environment for interdependent activity. Defines and enforces norms and roles for group members. Reinforces social rank.
	Does not facilitate organization formation; not transition between individual and environment.	Systematic organization potential, objectives can be accomplished, transition with environment.

COMPARISON OF URBAN LAYOUTS (continued)

CHARACTERISTICS	GRIDIRON BLOCKS INDIVIDUAL LOTS	GRID BLOCKS CLUSTER LOTS
Economic/ Administrative	Tends to isolate family unit. Larger individual loans, larger term mortgages, guarantees provided by individuals, larger administrative costs.	Facilitates the creation of small cooperatives. Smaller individual loans, shorter term mortgages, guarantees provided by groups, smaller administrative costs.
Land Coverage	Provides only private land for lots. Land coverage and open spaces not subject to social control but to public sector and bureaucratic control.	Allows minimal land for lots and maximum land for cluster. Social control over common land.
Land Tenure	Inflexible, does not promote physical changes: the subdivision of large lots nor the assembly of parcels due to lot configuration and multiple ownership.	Flexible, facilitates physical changes: the subdivision or assembly of parcels because land is larger and held in group control.

public circulation.

Ultimately, the most important distinction between these two types of block layout is their propensity to promote the capability of the users to exercise greater (or lesser) control over their physical and socio-economic environment. Organization implies structuring and an interdependent cooperative effort, people working together to accomplish objectives. As human interaction increases, the potential for cooperative effort and common purposes makes control over the environment possible. Grid Blocks/Cluster Layouts, as opposed to Gridiron Blocks/Individual Lot Layouts, foster group development.

The usual configuration of grid blocks is a series of individually-owned lots around a jointly owned, semi-public court. Cluster layouts have a specific requirement: that the physical arrangement and land ownership is such that the group of families has exclusive use, responsbility, and control of their common space. The central area is held in condominium. There are significant advantages to this layout:

Financial: It allows layouts at high density without sacrificing the efficiency of utility and infrastructure development. The distribution networks can be placed along the lines of circulation to facilitate the initial installation as well as continuing maintenance. Grid layouts provide the prospect for staged development with lower initial cost. For example, at the outset, a single utility connection can be made to each cluster for water and electricity. These services can be metered and used communally until such time as the users are able to afford individual connections. In the cluster layout, the potential exists for a completely on-site sanitation disposal system which can be constructed and maintained entirely by the users. [See Appendix (2).] In addition, clusters remove a large segment of land from institutional jurisdiction which can be isolated under the control of the inhabitants.

Social: The grid layout defines the group. Through physical plan arrangement the cluster establishes in a concrete way an environmental boundary which allows a strong sense of mutual obligation to operate. It provides a buffer between the family unit and the general environment for each family member to suit his particular needs. Through the use of the cluster an orderly hierarchy of transitional states can soften the impact between environ-

mental uncertainty and the individual. The cluster serves as a nucleus around which communal initiatives can be fostered. It can be perceived as the basic performance unit where the actual work of education and health care are carried out. In terms of the open-system concept, the cluster is the backdrop where processes can operate, where inputs are transformed into outputs. Clusters are systems, systems of physical layout and human interaction. The basic power unit for exerting the will of people can be the individual and combinations of clusters.

SUMMARY. Urban layouts are systems which can have a significant impact upon human behavior. Patterns of circulation (lines of circulation and lines of access) determine block layout (gridiron blocks and grid blocks). Block layouts, in turn, determine traffic flow, land subdivision, utility distribution networks, and configurations which influence social structure. Grid (cluster) blocks enhance sustained group formation, gridiron blocks do not. Grid (cluster) blocks foster interdependent, integrated activity. They provide a back-drop for individuals to influence the planning of communal effort, the execution of tasks in the group interest, and the control of organizational initiatives.

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APPENDIX (1)

From an address on the Population Problem by Robert S. McNamara, President of the World Bank, to the Massachusetts Institute of Technology, April 28, 1977.

CAUSES AND DETERMINANTS OF FERTILITY DECLINE. The task of understanding the factors leading to fertility decline is difficult. The complexities greatly outweigh the certainties. But it is at least possible to draw a number of tentative conclusions from recent research.

We can state with the basic fact that the demographic transition in the industrialized countries demonstrate that socio-economic development and mortality declines were accompanied by significant reductions in fertility.

That is clear enough. But what is not clear is this: which of the many elements of general development led to that specific result, and with what relative effectiveness? Must the developing countries reach the current levels of income per capita in the developed nations before they reach their fertility rates?

The question is further complicated by the evidence that certain culturally similar regions--those, for example, with a common language or ethnic background--moved through the fertility transition at the same pace, even though their economic conditions differed substantially. This suggests that in these instances cultural considerations were more decisive than economic advance. Further, there is ample evidence that vastly different fertility rates exist in developing countries with the same income levels, and that rates of change in fertility rates appear to bear little correlations with changes in income per capita.

The truth appears to be that a complicated mix of variables is at work, some economic, some not. Mortality decline, urbanization, educational advance, higher aspirations for one's self and one's children--all these elements appear to be involved in differing combinations.

Though we can learn from the experience of the developed nations, we must recognize that their historical circumstances were quite dissimilar to those in the developing countries today.

The developed nations entered their fertility transition with lower birth rates, lower growth rates, and much more gradual mortality declines. By the time their death rates had fallen substantially, their industrial infrastructure was already in place. Expanding job opportunities were available either in the cities, or in the New World overseas, which received tens of millions of European immigrants. Further, the age of marriage was relatively late,

and the literacy rate relatively high.

The developing nations are confronted with a very different set of circumstances, most of them unfavorable, but some of them advantageous.

Their mortality decline has been the most precipitous in history: five times faster than in the developed nations. In the eight years between 1945 and 1953, Sri Lanka, for example, had as great a decline in mortality as had occurred in Sweden in the entire century between 1771 and 1871. That phenomenon has rapidly driven up growth rates all over the developing world. On the other hand, both individual families and government policymakers can directly perceive that the number of surviving children is much greater than in the recent past, and this may well move them to consider a smaller family norm.

Compared to the last century, the means of controlling birth are far more numerous, more effective, and more easily available.

Modern mass communications are both more pervasive, and more influential. The elite in the developing countries, and increasingly the mass of the people as well, are becoming more aware of living standards in the developed world, including smaller family size and less traditional life styles. Exposure to alternate possibilities stirs their imaginations, and affects their aspirations.

Governments have much greater ability now to reach across subnational barriers of linguistic, ethnic, and cultural differences, and can stay in touch with villagers, if they choose to do so.

Debate about education policy continues, but most developing countries regard basic literacy for both males and females as essential for development goals, and greater national unity.

Finally, there are an increasing number of governments in the developing world committed to lowering fertility, and an even larger number supporting family planning programs. In 1969, when as President of the World Bank I spoke on population, at the University of Notre Dame, only about 40 developing countries officially supported family planning, and only 20 of those had specific policies to reduce fertility. By 1975 there were 63 countries with official family planning programs, and 34 with explicit policies to reduce the growth rate.

Now all of this is encouraging.

And in view of it, what are the conclusions we can draw about the linkages between socio-economic development and fertility? More specifically, which are those key elements that can be deliberately managed so as to accelerate fertility reduction?

LINKAGE OF FERTILITY DECLINE TO SOCIAL AND ECONOMIC DEVELOPMENT. We still cannot be as certain as we would like in this matter, but we do know that the following factors are important:

Health - Improving the level of health, particularly of children, insures the survival of a desired minimum of offspring, and provides parents with greater incentive for planning and investment for both their children and themselves. Since 1950, all substantial fertility declines in the developing countries have been preceded by substantial declines in mortality.

Education - Broadening the knowledge of both males and females beyond their familiar and local milieu enables them to learn about and take advantage of new opportunities, and to perceive the future as something worth planning for, including personal family size.

Broadly Distributed Economic Growth - Tangible improvement in the living standards of a significant proportion of the low-income groups in a society provides visible proof that aspirations for a better life can in fact be realized, and that a more compact family size can have economic advantages.

Urbanization - Despite the many problems connected with migration from the countryside to the city, it generally does offer greater accessibility to health services and education; increased familiarity with the more modern economic sector; and new savings and consumption patterns: all of which tends to alter attitudes towards traditional family size.

Enhanced Status of Women - Expanding the social, political, occupational, and economic opportunities of women beyond the traditional roles of motherhood and housekeeping enables them to experience directly the advantages of lowered fertility, and to channel their creative abilities over a much broader spectrum of choice.

Now let me sum up here what we have been discussing.

The central issue is: which are those specific elements of economic and social development that bear most effectively on reducing fertility?

I have suggested several. But how can we be sure they are likely to work?

One way is to examine carefully the available data for any apparent correlations with indicated levels of the crude birth rates (see Table VII).

The data demonstrate that there are such apparent correlations. What they do not prove conclusively is an ironclad causal connection.

But the figures in Table VII, and those in Table VIII, do establish that fertility levels and levels of certain specific socio-economic indices tend to move together.

Thus declining levels of infant mortality, and rising levels of nutrition, literacy, and

Table VII

"Correspondence" in 1970 between Crude Birth Rates and Selected Development Indicators

	No. of Countries	CBR Over 45	CBR 40 to 44	CBR 30 to 39	CBR Less Than 30
Health					
Infant mortality (rate per thousand)	34	128	84	61	20
Life expectancy (years	43	46	57	64	68
Education					
Literacy (percent of population over 15 years of age)	39	33	57	78	80
Urbanization					
Adult male labor in agriculture (percent of total male labor)	46	77	64	45	15

SOURCE: Population Council Data Bank.

nonagricultural employment appear to be accompanied by lower birth rates.

In 1970, for example, countries with a crude birth rate greater than 45, had on average an infant mortality rate of 128 per 1,000; an adult literacy rate of 33%; and 77% of the male labor force in agriculture.

Countries with a crude birth rate about 5 points less--a CBR of 40 to 44--had on average an infant

Table VIII

Trends of Crude Birth Rates and Selected Development Indicators: 1960-70

	No. of Countries	Median Value of CBR and Devel. Indicators 1960	1970	Percentage Change
Crude birth rate	26	46	42	-9%
Health				
Crude death rate (per thousand)	22	11.8	9.8	-17
Life expectancy (yrs.)	17	57	61.4	+8
Infant mortality rate (per thousand)	15	80	68	-15
Inhabitants per physician	46	7,730	6,212	-20
Nutrition				
Calorie consumption (per capita per day)	34	2,110		+9
Protein consumption (grams per capita per day)	33	55.9		+10
Education				
Literate as % of population (age 15 and over)	14	61		+21
Urbanization				
Adult male labor in agriculture (%)	24	60		-11

mortality rate of 84; a literacy rate of 57%; and 64% of the male labor force in agriculture.

But for countries with CBRs in the range of 30 to 39, infant mortality on average had fallen to 61; literacy had climbed to 78%; and only 45% of the male labor force was in agriculture.

Finally, for countries with crude birth rates of less than 30, the infant mortality rate on average was down to 20; literacy was at 80%; and only 15% of the male labor force was in agriculture.

The correspondence in these examples is clear. The higher levels of health and education and non-agricultural employment are associated with lower levels of fertility.

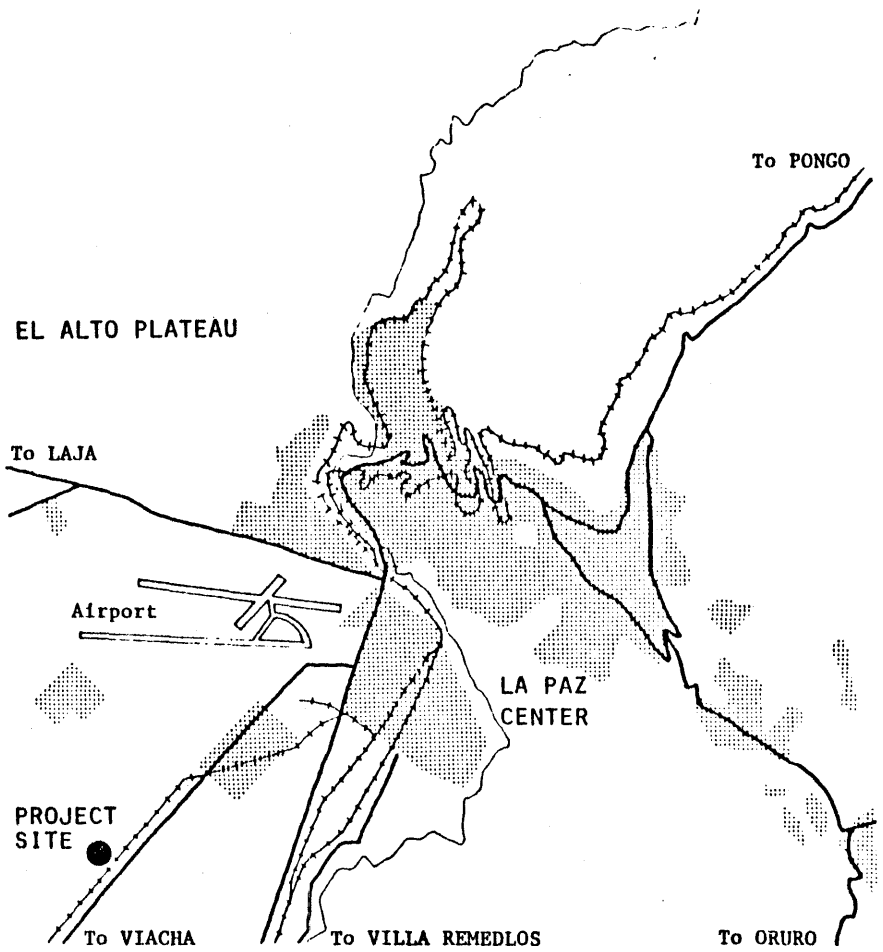
But I want to repeat again. The correlation appears to be with specific elements of development--literacy, for example, and nutrition and infant mortality--rather than with the general level of economic wealth.

APPENDIX (2)

The following example, a contemplated design for La Paz Bolivia, is illustrative of how it is possible for an on-site sewage disposal system to increase the determinancy of the sanitation disposal problem by isolating it from environmental uncertainty and by increasing users participation. It is part of a study prepared by the first year participants in the Urban Settlement Design Program during the Spring Semester, 1980. The project site, is under consideration as one of the second series of site and services projects in Bolivia to be funded by the World Bank.

This design is a staged development. Patterns of primary infrastructure systems are defined by the circulation. Sewage disposal is to be developed on site. The grid (cluster) layouts have been designed sufficiently large to provide adequate percolation capability for effluent and grey water. By defining groups, these layouts put bounds on an integrated, cooperative effort. By engaging in the activity of designing and constructing a treatment facility, the interactions between members increases. Increased interaction, as we have previously suggested, produces even more sentiments and activities.

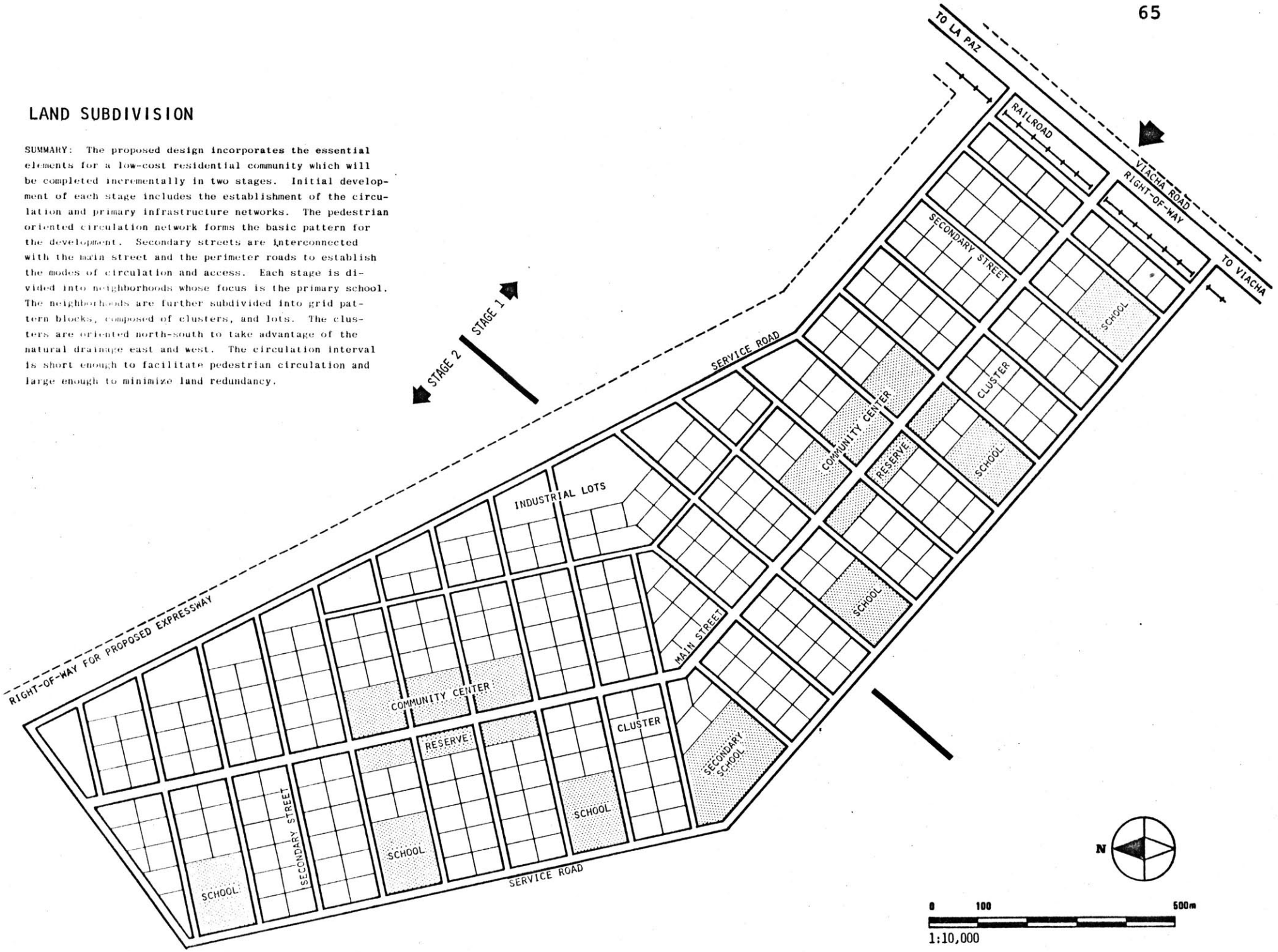
Four sewage disposal options are compared: aqua-privy, pit latrine, compost latrine, and water-bourne network as a reference.



LOCATION OF PROJECT SITE

LAND SUBDIVISION

SUMMARY: The proposed design incorporates the essential elements for a low-cost residential community which will be completed incrementally in two stages. Initial development of each stage includes the establishment of the circulation and primary infrastructure networks. The pedestrian oriented circulation network forms the basic pattern for the development. Secondary streets are interconnected with the main street and the perimeter roads to establish the modes of circulation and access. Each stage is divided into neighborhoods whose focus is the primary school. The neighborhoods are further subdivided into grid pattern blocks, composed of clusters, and lots. The clusters are oriented north-south to take advantage of the natural drainage east and west. The circulation interval is short enough to facilitate pedestrian circulation and large enough to minimize land redundancy.



APPENDIX (2) -- Continued

SEWAGE DISPOSAL OPTIONS. Conventional water borne sewage systems with sewage treatment plant are not a viable alternative in the developing world for principally three reasons. First, according to World Bank estimates the total capital required for the construction of conventional systems far exceeds the resources availab.e Second, a substantial amount of water is required simply as an excreta carrier in water-borne systems. Third, the technological requirements of conventional water-borne sewage systems exceeds the capability of most developing areas. Low-cost sanitation disposal solutions which maximize user participation in the planning, execution, and control of projects are required.

There are a number of appropriate options. These options are less expensive to construct, they do not rely on large amounts of water for operation and when properly designed and constructed, keep the risks of disease transmission and ground water pollution within acceptable limits. Two key considerations which assist in the classification of systems are whether they are wet or dry and whether they are on-site, local, and capable of being developed incrementally. If a system is wet or dry, determines the water use and, in turn, the cost, pollution control, and a host of other impacts. As on-site/local disposal system isolates the problem of pollution significantly, and tends to keep the level of technology within the local capability. Within the options there are communal and individual lot sub-options.

SUITABILITY OF BLOCK/LOT LAYOUTS
FOR SEWAGE DISPOSAL OPTIONS

	OPTIONS	GRID BLOCK CLUSTER LOT	GRIDIRON BLOCK INDIVIDUAL LOT
CONVENTIONAL	Communal	Positive	Negative
WATERBORNE	Individual	Positive	Positive
AQUA PRIVY	Communal	Positive	Negative
SEPTIC TANK	Individual	Positive	Negative
PIT	Communal	Positive	Negative
LATRINE	Individual	Positive	Negative
COMPOST	Communal	Positive	Negative
LATRINE	Individual	Positive	Negative

The physical environment has a significant impact upon the choice of appropriate sanitation disposal technology. Since on-site systems depend upon the

absorption capability of soil it is important to examine the assumptions and criteria which govern its use. Some soils can absorb sewage effluent for sustained periods. Other soils have very limited absorbtive capability regardless of the disposal area.

A classification of soil by their limitations can guide system selection. The use of such classifications does not eliminate the need for on-site investigations to determine conditions at a specific site. The three degrees of limitation are defined as follows:[1]

SLIGHT LIMITATION. The soils are well drained, though not excessively drained. They are composed of sandy and gravelly materials and have no stones on the surface or below. They are rapidly permeable and occur on 0-8 percent slopes. They do not have layers with 5.5 feet of the surface that inhibit the downward movement of the water.

MODERATE LIMITATION. The soils are rapidly permeable and have formed in sandy and gravelly materials, they occur on 8-15 percent slopes. Careful selection of disposal area is required so as not to contaminate water sources. Some of the soils in this limitation class occur on 0-8 percent slopes, but they have a very rocky, very stony, or extremely stony surface and contain stones below the surface.

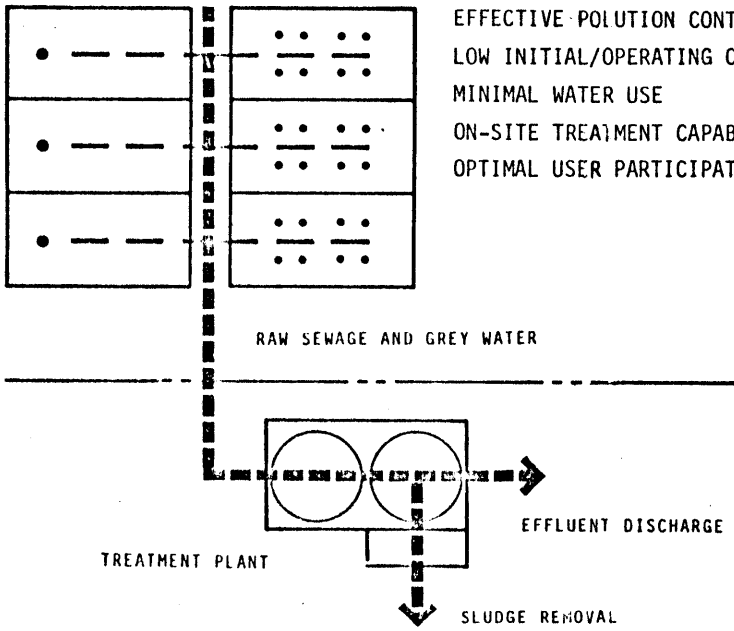
SEVERE LIMITATION. These soil areas require intensive site preparation to overcome soil conditions especially in higher density areas. The soil problems involve one or more of the following conditions.

- Bedrock within 5.5 feet of the surface.
- Slow or moderately slow permeability in the substratum.
- High water table, at or near the surface.
- Slope gradients greater than 15 percent.
- Subject to flooding by stream overflow.
- Extremely rocky surface.

Once soil permeability has been established by approximation and actual on-site test, the selection of a system can be initiated. In slight limitation areas a wider range of options can be considered. In moderate and severe limitation areas, the choices may be restricted to dry systems. No single system has universal applicability. However, it is possible to establish parameters which can guide the selection of a system best suited to a particular locale. The following charts and tables compare the four basic systems, three of which have applicability for on-site implementation.

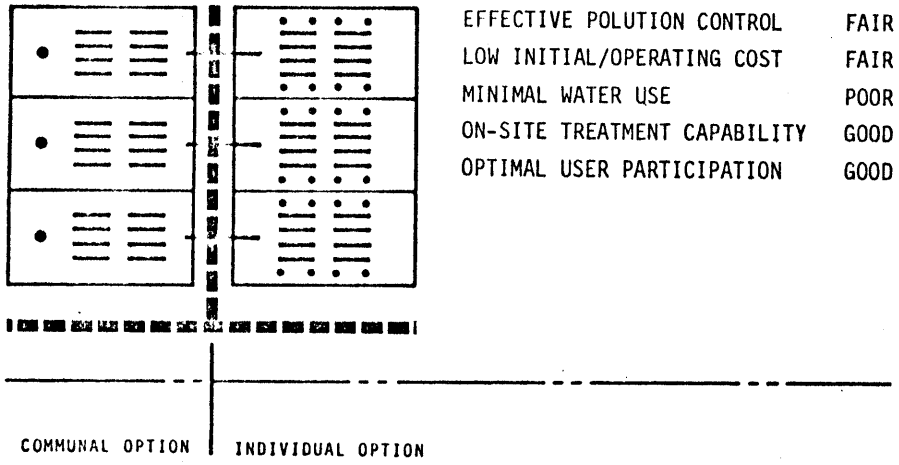
WET SYSTEMS

CONVENTIONAL WATER-BORNE



EFFECTIVE POLUTION CONTROL	GOOD
LOW INITIAL/OPERATING COST	POOR
MINIMAL WATER USE	POOR
ON-SITE TREATMENT CAPABILITY	POOR
OPTIMAL USER PARTICIPATION	POOR

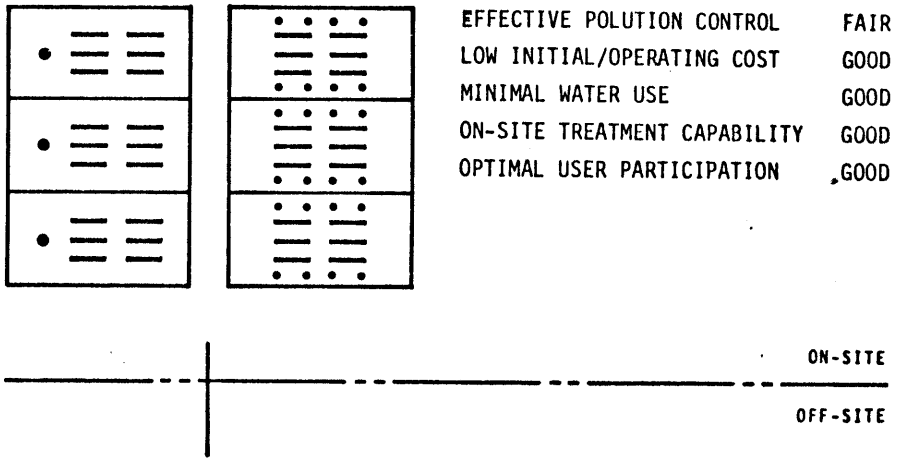
AQUA-PRIVY/SEPTIC TANK



EFFECTIVE POLUTION CONTROL	FAIR
LOW INITIAL/OPERATING COST	FAIR
MINIMAL WATER USE	POOR
ON-SITE TREATMENT CAPABILITY	GOOD
OPTIMAL USER PARTICIPATION	GOOD

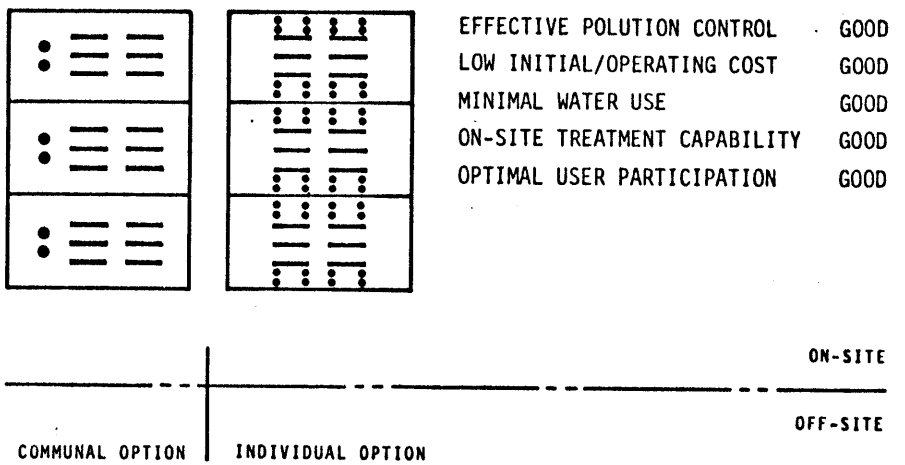
DRY SYSTEMS

PIT LATRINE



EFFECTIVE POLUTION CONTROL	FAIR
LOW INITIAL/OPERATING COST	GOOD
MINIMAL WATER USE	GOOD
ON-SITE TREATMENT CAPABILITY	GOOD
OPTIMAL USER PARTICIPATION	GOOD

COMPOST LATRINE



EFFECTIVE POLUTION CONTROL	GOOD
LOW INITIAL/OPERATING COST	GOOD
MINIMAL WATER USE	GOOD
ON-SITE TREATMENT CAPABILITY	GOOD
OPTIMAL USER PARTICIPATION	GOOD

SEWAGE DISPOSAL SYSTEM SELECTION CRITERIA

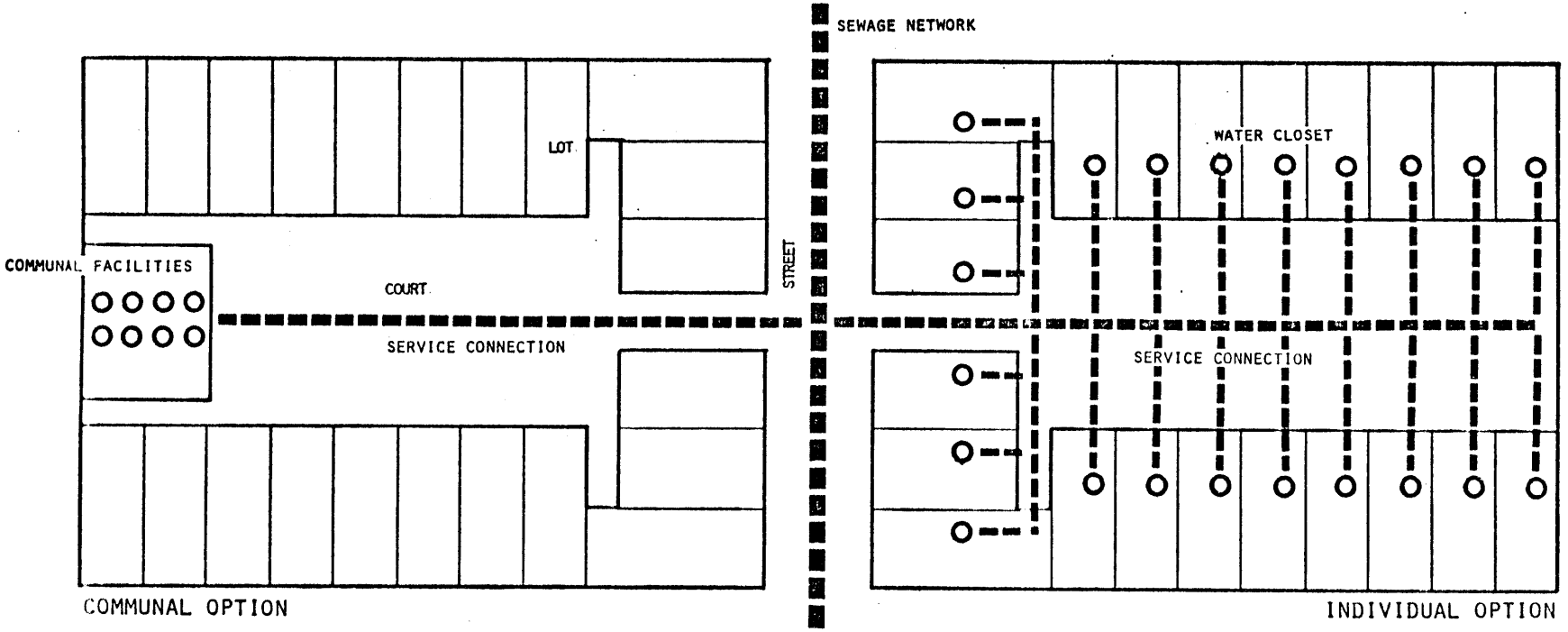
		CONVENTIONAL WATER-BORNE SEWAGE W/ TREATMENT PLANT				AQUA-PRIVIES/SEPTIC TANKS INCLUDING PERCOLATION				PIT LATRINES INCLUDING PERCOLATION				COMPOST LATRINES INCLUDING PERCOLATION			
		ADVANTAGE		DISADVANTAGE		ADVANTAGE		DISADVANTAGE		ADVANTAGE		DISADVANTAGE		ADVANTAGE		DISADVANTAGE	
		+2	+1	-1	-2	+2	+1	-1	-2	+2	+1	-1	-2	+2	+1	-1	-2
A.	HEALTH CRITERIA																
3	Effective treatment*	6					3			6				6			
3	Pollution of soil	6						3				3		6			
3	Pollution of groundwater	6							6			3		6			
3	Surface water pollution				6		3					3		6			
3	Access by insects	6				6						3			3		
2	Sludge build-up				4				4				4	4			
2	Operations dependent upon soil	4							4		2			4			
1	Odors	2					1					1					2
B.	SOCIO-ECONOMIC CRITERIA																
3	Cost-less than 10% of house				6			3		6				6			
3	System subject to blockage				6	6				6				6			
3	Minimal use of water				6				6	6				6			
3	Institutional input required				6			3		6				6			
3	Local materials & technology				6	6				6				6			
3	Cultural acceptability				6				6	6							6
3	On-site treatment				6	6				6				6			
3	User participation				6	6				6				6			
2	Simple toilet routine	4				4				4							4
2	Progressive development possible	4				4							4				4
2	Multi-storey use possible	4				4							4				4
2	Ease of maintenance				4				4	4							4
2	Sludge re-use		2			4							4	4			
1	Solid waste disposal possible	2							2	2				2			
1	Design knowledge availablity	2				2				2					1		
*no pathogen survival; full BOD digestion																	
	TOTAL	-14				+14				+39				+60			

EXAMPLE: The health and socio-economic factors are weighed in value from 3 to 1, i.e.; odors 1; pollution of soil 3. These criteria are compared to each of four options/systems as a relative advantage or disadvantage from plus 2 to minus 2, i.e., under pit latrine, on site treatment, plus 2; multi-storey use possible, minus 2. The relative advantage or disadvantage is multiplied by the weighted value. The arithmetic sum of the products is compared.

CONVENTIONAL WATER-BORNE SEWAGE WITH TREATMENT PLANT

Excreta and other household wastes are transported usually off site to a central treatment plant. Collection networks are designed to work on gravity. Pollution of soil, ground water, and surface water by raw sewage is minimized. Contamination from effluent can be a serious problem. Voluminous supply of water necessary for efficient operation. System requires large, front-end, capital outlays. Because of expense and lack of emphasis by institutional officials on the problem of waste disposal, the plans for central treatment plants are often ignored. Extensive technological requirements limit user input to collection networks. Operational facilities rarely coincide with the completion of lot improvements and housing.

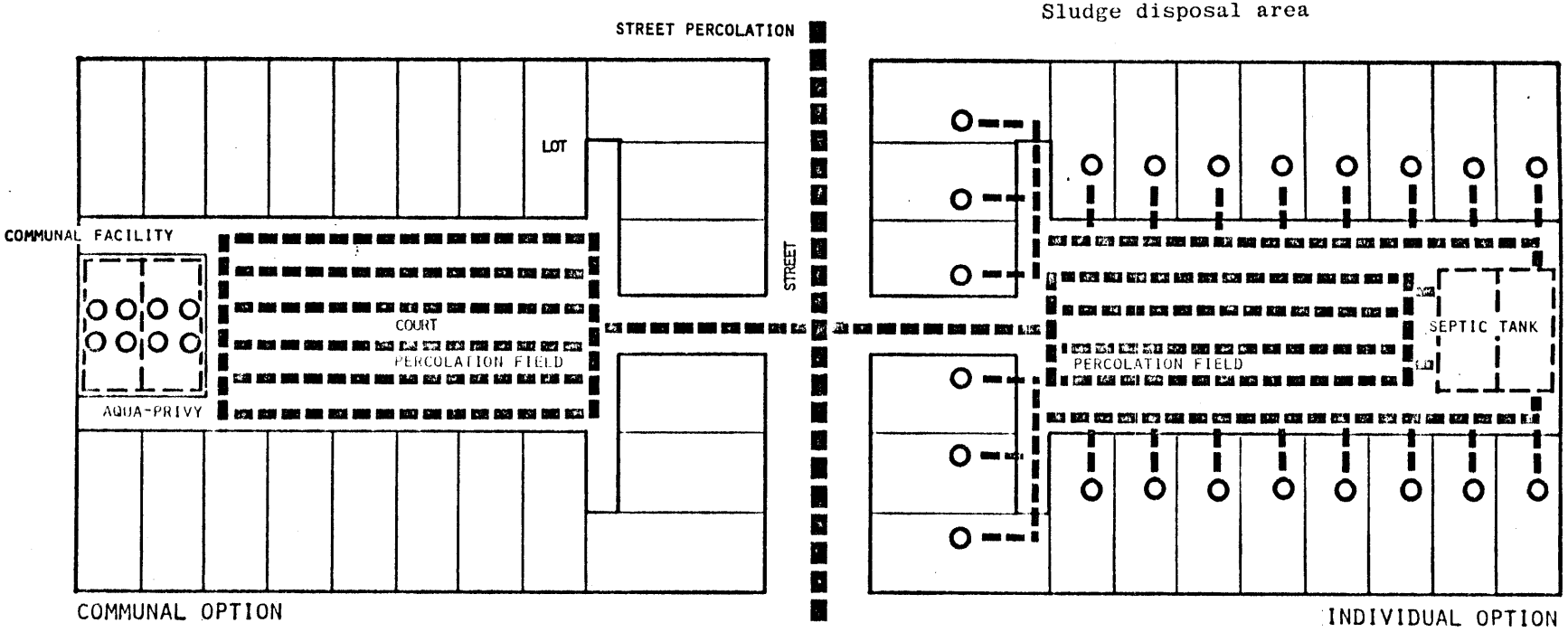
	COMMUNAL OPTION	INDIVIDUAL OPTION
LOT	No sewage or grey water disposal facilities provided.	4" service connections to each lot for toilet, shower, & kitchen sink drain.
CLUSTER	6" service connections for communal toilets, showers, & laundry tubs. Subsurface drainage piping from facilities to street.	Service connection from each lot connected to branch sewer & subsequently to trunk sewer in street.
PUBLIC LAND	Water borne network including branch & trunk sewers, manholes for conveying sewage beyond site boundary to treatment plant.	Water borne network same as communal option.



AQUA-PRIVIES/SEPTIC TANK INCLUDING PERCOLATION SYSTEM:

Communal level, Aqua-Privy: From a squatting plate excreta is deposited into a vertical drop pipe whose level is set just below the water surface of the tank. It is important that the water seal is maintained. Solids sink to the bottom of the tank to be digested anaerobically, forming sludge. Periolically sludge must be removed and disposed of by burying or composting. Effluent is combined with grey-water and drained off to a percolation system. Individual level, septic tank: Similar except tank is remote from service connections. These systems can handle the treatment and disposal of solids and effluent on site. Installation and maintenance of the entire system can be done by the users.

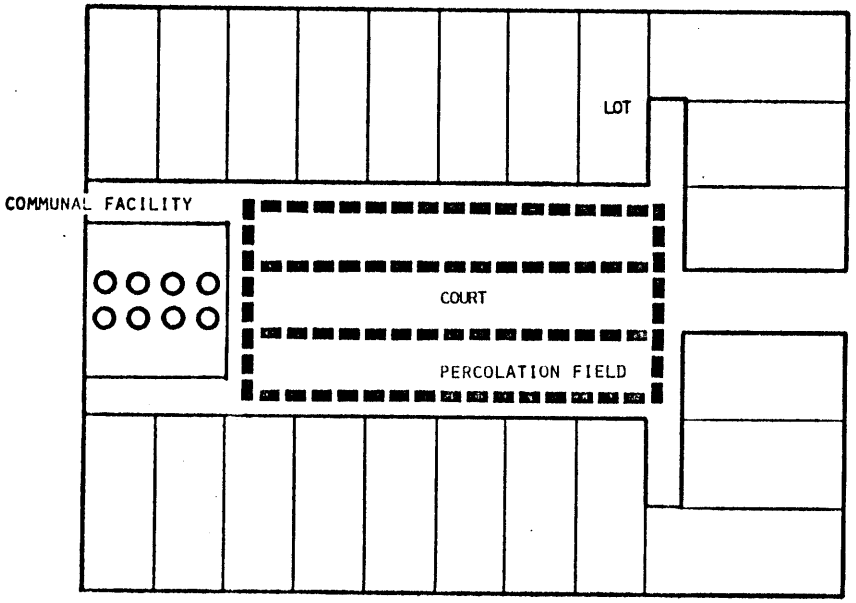
	COMMUNAL OPTION	INDIVIDUAL OPTION
LOT	No sewage or grey water disposal facilities provided.	4" service connections to each lot for toilet, shower, & kitchen sink drain.
CLUSTER	Service connections for aqua privey, shower, & laundry tubs to underground drainage field to percolation as required by soil conditions. Periodic removal of sludge	Drainage connection from each lot to septic tank. Effluent drain from tank to drainage field. Connection from drainage field to street percolation.
PUBLIC LAND	Drainage capacity to accommodate excess flow from clusters, under streets and other open public areas. No piping beyond site boundary. Sludge disposal area	Added drainage same as communal option.



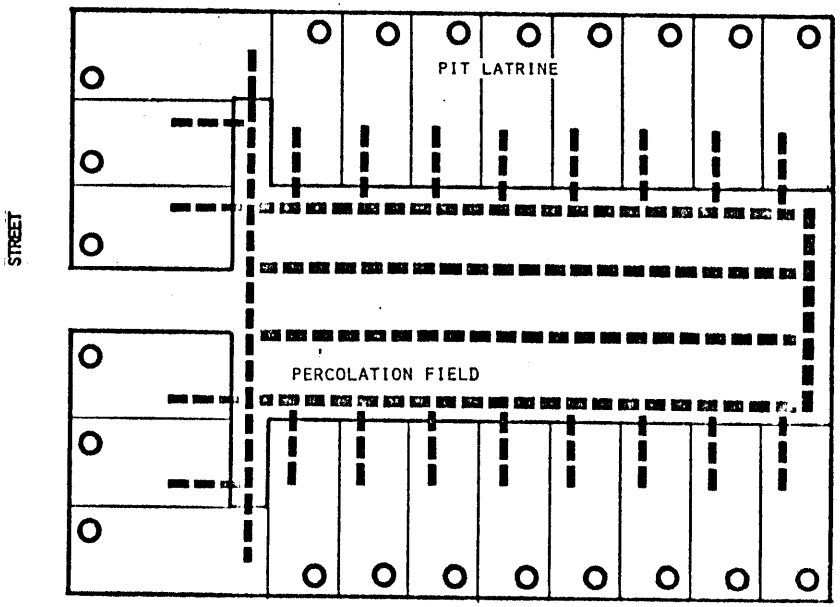
PIT LATRINE INCLUDING PERCOLATION SYSTEM

The pit latrine is an open pit dug or drilled, into which excreta is directly deposited. It can present health problems due to the openess of the pit which allows free access to flies and mosquitos. Kept dry, it can be an effective means of solids disposal with minimal threat of pollution. A wet pit, however, can be a contaminant to ground water and surface water. Location of pit latrines must be closely coordinated with water use practices. The use of these devices in urban areas on individual lots is not prohibitive; however, odors and the frequency of relocation in restricted areas make them less desirable. The use of pit latrine minimizes water requirements. Grey-water can be easily disposed of through percolation. This system can be a readily available operational on-site solution; installed and maintained by the users on an individual or communal basis.

	COMMUNAL OPTION	INDIVIDUAL OPTION
LOT	No sewage or grey water disposal facilities provided.	Pit latrines dug in dry location removed from drainage field. Service connection to each lot for shower, and kitchen sink drain.
CLUSTER	Communal pit latrines dug in dry location. Service connections for communal shower & laundry tubs to underground drainage field. Water use limited; no percolation requirements beyond cluster.	Drainage field for percolation of grey water. No percolation requirements beyond cluster.
PUBLIC LAND	No underground sewer drains required.	No underground sewer drains required.



COMMUNAL OPTION

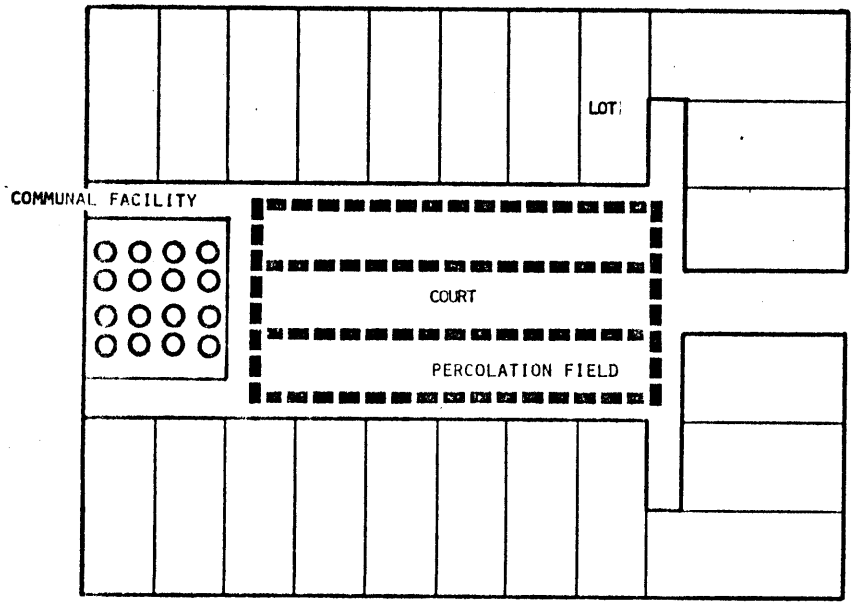


INDIVIDUAL OPTION

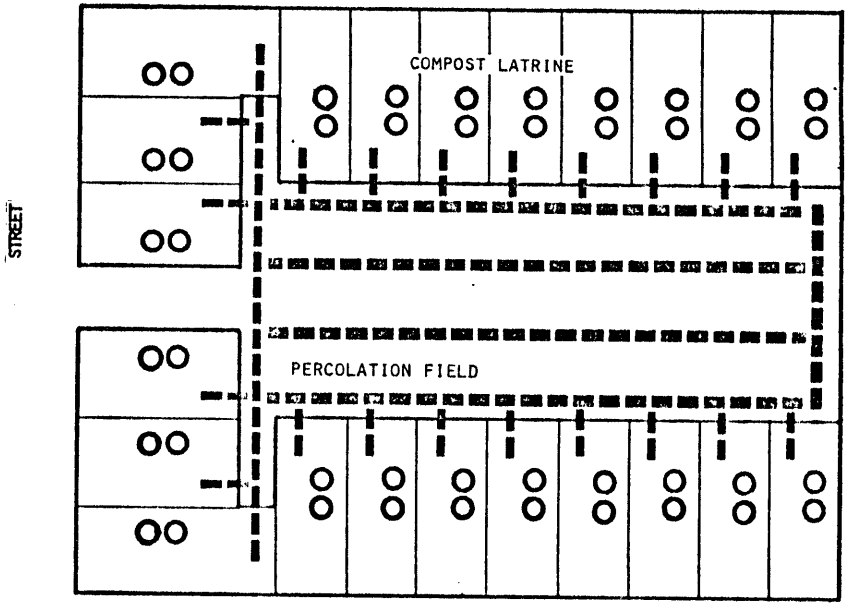
COMPOST LATRINE INCLUDING PERCOLATION SYSTEM

Composting is a system whereby organic solid wastes are converted to a stable reusable product. The process depends upon an appropriate balance, within sufficiently high temperature, between carbon and nitrogen. Many specific arrangements are possible to achieve optimum conditions for composting; they vary from intricately designed single chambers to simple double compartment devices. The attractive feature of this system is that it is dry, thereby completely isolating the problem of contamination. The demands for domestic water are reduced making the elimination of grey-water a minimal problem. Given that the system is culturally acceptable it can be installed on an individual or communal basis, on-site, by the users.

	COMMUNAL OPTION	INDIVIDUAL OPTION
LOT	No sewage or grey water disposal facilities provided.	Double chambered compost latrine each lot. Service connection for shower & kitchen sink drain.
CLUSTER	Communal double chambered compost latrines. Service connection for communal shower & laundry tubs to underground drainage field. Water use limited; no percolation requirements beyond clusters.	Underground drainage field for percolation of grey water. No percolation requirements beyond clusters.
PUBLIC LAND	No underground sewer drains required. Disposal area for decomposed humus required.	No underground sewer drains required. Disposal area for decomposed humus required.



COMMUNAL OPTION



INDIVIDUAL OPTION

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