

COMPREHENSIVE SETTLEMENT PLANNING IN THE
MACKENZIE RIVER DELTA, N.W.T.:
A PROPOSED PLANNING THEORY AND METHODOLOGY

by
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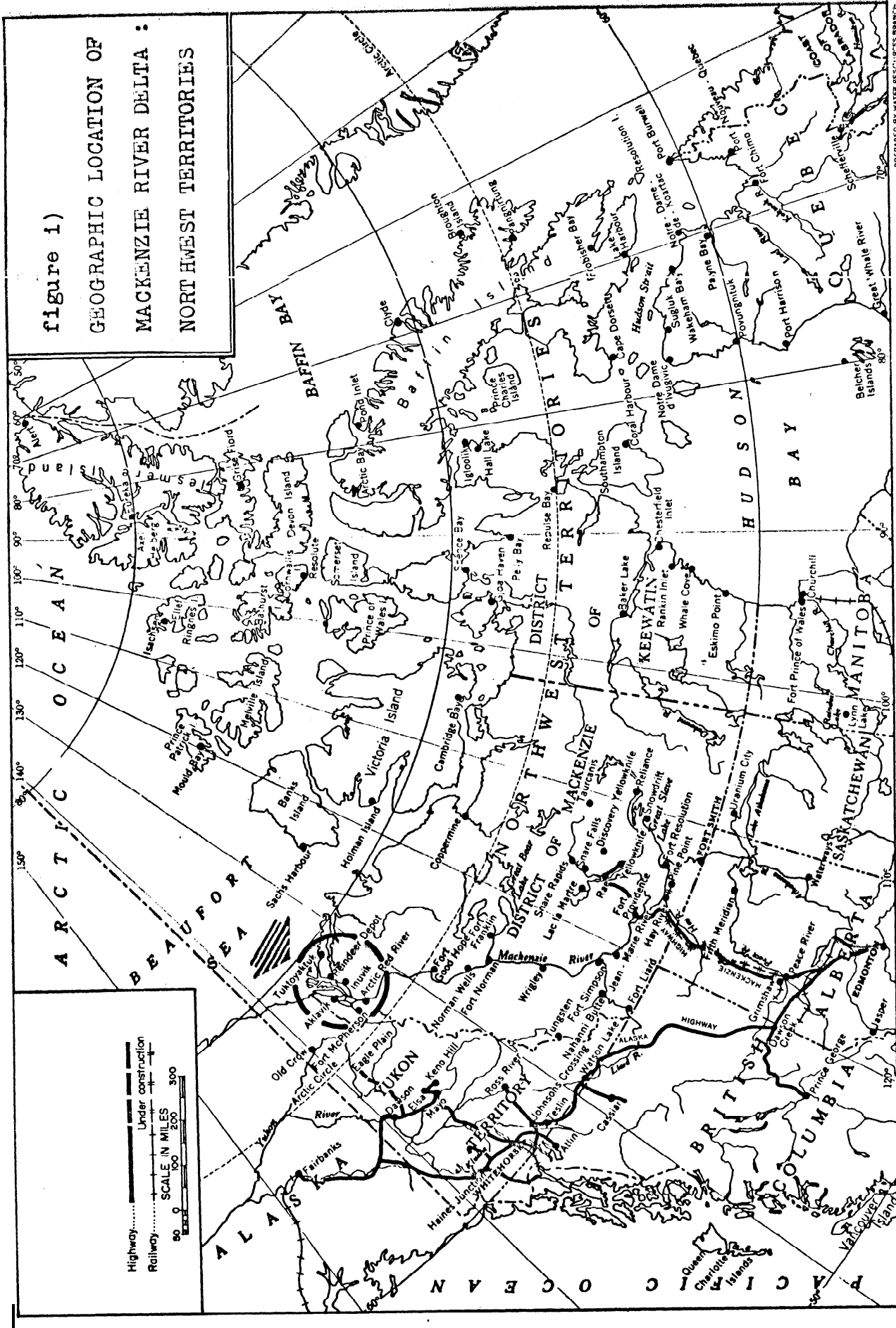
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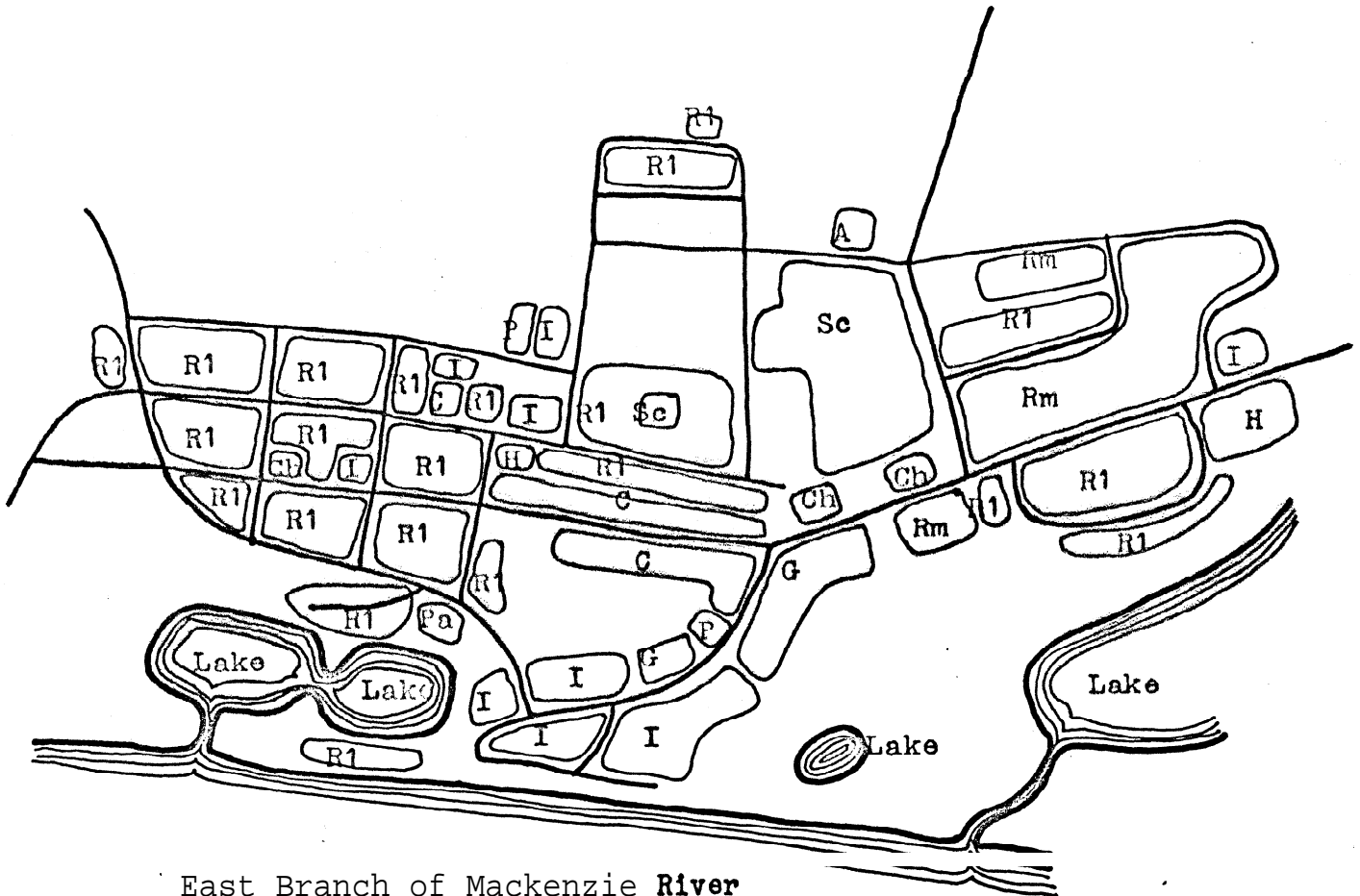
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Figure 1)

GEOGRAPHIC LOCATION OF
MACKENZIE RIVER DELTA :
NORTH WEST TERRITORIES



PREPARED BY WATER RESOURCES BRANCH



East Branch of Mackenzie River

EXISTING LAND USE
OF INWIK

figure ii

LEGEND

- A - agricultural uses (experimental farm)
- C - commercial uses (retail stores, theatre, bakery, offices, etc.)
- G - governmental uses (offices, Navy base, fire hall etc.)
- Ch - church
- Pa - park and playground
- P - public gathering places (Ing-A-Mo Half and Legion Mall)
- H - hospital facilities
- R1 - single family dwelling units
- Rm - multiple family dwelling units (apartments)
- I - industrial uses (storage, garages, powerhouse, etc.)
- sc - schools, playgrounds, and living hostels

ABSTRACT

The arctic and subarctic regions of Canada are increasingly developing as integral, participating parts of the total Canadian and world scene.. Basic to this development in the North are the 'human, natural physical, and designed or man-made environments. This study is concerned with one aspect of the designed environment: human settlements. On the basis of an evaluation of the existing settlement planning situation, an attempt is made to develop a skeletal, yet consistent, theory and methodology for settlement planning in the Mackenzie River Delta, Northwest Territories. The approach is from a comprehensive point of view, and includes social, economic and physical criteria directly in the planning process. A combined systems-factor analysis technique is experimentally developed as an aid to creativity in the planning process. Preliminary results indicate both an immediate practical use and a good potential for the further development of the approach as a planning tool.

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The detailed development and conclusions in this report are entirely those of the author.

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CHAPTER ONE / INTRODUCTION

1.1 The Program and Aims

This present study arose through a request by Federal Government Officials for a planning "framework" to aid Northern settlement planners. These Officials felt that the present state of planning in the North could be improved, and requested ways in which these improvements could be initiated. **It** was particularly felt that existing studies on the North were, in general, of little direct benefit to a planner.

The research project, therefore, evolved as an integrative approach to settlement planning in Northern Canada. It represents the combined interests of the author; administrators and research officials within the Department of Indian Affairs and Northern Development, Ottawa; settlement planners working in the North; and other persons generally interested in Northern development.

The report is based on two general assumptions:

- 1) for any development process planning is not only desirable but necessary.
- 2) planning approaches which rely on the doctrine of spontaneous order (i.e. laissez-Faire or piece-meal planning) or those which rely on an entirely super-imposed order (such as utopian approaches) are inadequate in meeting today's settlement planning problems.

The aims as set out at the early stages by the sponsor of the project were:

1) to approach settlement planning in the North from an integrative point of view, thereby including social, economic and physical criteria as determinants of settlement form.

2) to develop a planning "framework" as an aid for settlement planners working in the North, and specifically for planners within the Department of Indian Affairs and Northern Development.

3) to approach the project in terms of both short and long-term benefits. From a short-term point of view, the project is considered to be an immediate, practical settlement planning problem, directing the work towards the practice - as against the theory - of planning. Because of this immediacy and practical application, it is anticipated the results will be of use primarily for short-term* planning projects. From a long-term point of view, the results will have a more general and lasting effect.

4) to develop the "framework" in a form adaptable to changing conditions of time and place;

5) to develop a planning "framework" that allows direct

*Short-term plans are essentially action-type or physical plans. For example, they show sites for housing and industry, areas to be allocated for parks, major additions to the road network, and so on. Long-term plans, on the other hand, are essentially policy plans which try, for example, to anticipate and guide the effects of change in technology, in the economy, and in population growth.

interdisciplinary participation.

6) to include field experience as part of the study.

1.2 Preliminary Approach

With these general aims set out, the author studied various areas in which he could familiarize himself with the North. The Mackenzie River Delta, N.W.T., was chosen as this area (refer to figure i, page i) since it has the following important characteristics:

- 1) it represents a major concentration of people in the W.W.T., and at the same time offers a manageable size both in terms of land area and population.
- 2) it has relatively distinct human and physical regional boundaries.
- 3) the area includes people with varied cultural backgrounds. The Kutchin Indians, the Western Arctic Eskimo, the "new Northerners",* and the average Canadian are represented alone and in combination.
- 4) the area includes a variety of topography and vegetation.
- 5) the possibility of coordinating research as part of the Mackenzie Delta Project sponsored by the Northern Co-ordination and Research Centre, Department of Indian Affairs and Northern Development,, Ottawa,

*A. term used to describe whites who have established residency in a Northern town, either because they have set up a local business or because they have married a native women (Cohen, 1962).

6) the availability of research data and facilities at the Scientific Research Laboratory, Inuvik, N.W.T. From May 1/66 to September 15/66, the author travelled extensively throughout the Mackenzie River Delta. Inuvik was used as the base settlement. The settlements of Tuktoyaktuk, Reindeer Station, Inuvik, Aklavik, Fort McPherson, Arctic Red River, and over one hundred outlying bush camps were visited. A period of time approximately proportional to the settlement size was spent in each of the Delta settlements and its immediate area.

The purpose of the field work was to directly observe and to document this observation, in this way to better understand and appreciate the over-all functioning of the Mackenzie River Delta settlements. The author attended as many private and public functions as possible, met both formally and informally with people from all age groups, ethnic backgrounds and occupations, and observed and recorded generally the observable living patterns in the settlements.

1.3 Prelude to Following Chapters

A rationale or general philosophical basis for comprehensive settlement planning in the Mackenzie River Delta is proposed in Chapter Two. Chapter Three includes an analysis of the present state of planning in the Canadian North, an identification of the particular problem, specific objectives, and criteria for determining when these objectives

have been reached,, The next two chapters deal with the solution to this particular settlement planning problem: Chapter Four presents the proposed solution in theoretical terms, and Chapter Five presents the solution in operational terms. The final chapter proposes general recommendations and conclusions for the study.

CHAPTER TWO / PHILOSOPHICAL BASIS OF SETTLEMENT PLANNING

2.1 General Considerations

In terms of both understanding and of advancing knowledge and action, it is necessary **that** both theory and substantive bodies of fact be interrelated.* When viewed in this way, theory serves several major functions:

- 1) to make explicit the "why" or rationale of the subject matter.
- 2) to provide for the cumulation both of theory and of research findings,
- 3) to originate new hypotheses through exploration of new implications.
- 4) by providing a rationale, to introduce a ground for prediction and criticism that is more secure than mere extrapolation from previously observed trends.

To exemplify these points, firstly consider the situation where a planner who is unfamiliar with the way of life in a northern settlement is forced to rely on his immediate impressions of the situation and his past planning experience, in order to make the necessary planning decisions. Assume that in this case the planner concludes that the settlement lacks a sense of "order". That is, because the planner has only a personal and extremely limited appreciation of

*For detailed discussions on this topic refer to (Merton, 1957), (Miller, 1964), (Dewy, 1938), (Kaplan, 1964), and (Westie, 1957).

the situational context, when faced with making a decision he is forced to apply a very general, formalized, and predetermined concept of "order" to the situation. However, what does this predetermined concept of "order" mean in a dynamic, real situation? Does this real situation possess a unique "order" yet to be determined? Since the planner is not familiar with the situation and has no operational "guidelines" at his disposal, in the context of the real-life situation, this decision is therefore essentially arbitrary.

Consider next a planner born and raised in the North and entirely familiar with the situational context of northern settlements. Assume in this case that the planner is of Eskimo background and has very strong personal preferences and convictions regarding the structure and form of settlements. However, without an explicitly stated philosophical basis, it is likely that any decisions made by this planner will be strongly directed towards his personal preferences and convictions. The chances of these decisions being publicly acceptable are limited. Even if implemented, the potential long-range success of such decisions is extremely questionable.,

Finally, consider a creative planner familiar with all the ways of life in a northern settlement and in a position to make objective planning decisions. Also, assume that this planner has both competently evaluated the problem and

concluded his work with a plan for a particular settlement. Although we now have a "solution" to the problem, many questions remain unanswered, such as: operationally, how is this plan to be implemented; what relationship does this plan have to the long-range development of the community; by what feedback procedures will the plan be modified and adapted through time?

From these examples, we can establish certain planning criteria for northern settlements:

- 1) northern planners must be familiar with the situational context (i.e. subject matter), either through experience or by having the necessary information readily and operationally available.
- 2) objective planning decisions are necessary in order to satisfy public rather than personal needs,
- 3) if a consistent, rational and continuing development is to become integral to northern settlements, planning decisions must be made in accordance with an explicitly stated, underlying philosophical basis.
- 4) from both an operational and philosophical point of view, "plans" in themselves, are inadequate in solving settlement planning problems.

The sections following represent a first attempt to satisfy these criteria,

2.2 Settlement Planning Defined

Although a general theory of planning has yet to be developed, a number of works have contributed towards this end.¹¹ The general usage of adjectives such as regional, settlement, city, economic, industrial, and social applied to the word "planning", and the commonality of many methods and techniques which underlie the work of all those engaged in planning, suggests a certain unity of approaches in all forms of planning endeavors.

In an attempt to circumscribe and clarify the field of settlement planning, a number of interrelated meanings can be distinguished. Mannheim has suggested a classification system which is useful in this regard (Mannheim, 1941). This classification system is based on the acceptance of change as one major Invariant of man's natural and social universe.^{**} Mannheim points out that historically man has perceptively related himself to this change process in a number of ways, and that corresponding to each thought or "idea" phase are very distinct changes in conduct and action of which it is a part: idea and action are consequently

¹¹See the works of Karl Mannheim, Rexford Tugwell, Robert Dahl, Charles E. Lindblom, Edward Banfield, Christopher Jones, and Herbert A. Simon.

^{**}This is probably more than an assumption. The view that change is real is represented in Western thought by many noted and well-respected thinkers from Heraclitus in ancient times, to Vico, Schopenhauer, Hegel, Marx, Spencer, and Nietzsche, and to Bergson and Whitehead in this century.

closely interdependent, The three fundamental phases, listed in increasing order of complexity, are:

1) the most primitive form of human thought (primitive in the sense of closely relating to animal behaviour) is characterized by the fact of chance discovery preceded by trial and error. Chance discovery expresses itself in direct action on and reaction to the stimuli of the surroundings, The achievement of thought lies in remembering the correct solution which has been discovered. Although a precise, exacting knowledge of the environment is not necessary in order to result in a successful adaptation, a change in the environment directly affects the achievement and necessitates a further chance discovery in order to maintain a certain adaptive equilibrium.

2) the second, or inventing, phase of human thought consciously modifies and directs tools and institutions towards particular goals. The achievement results when thought is directly related to the immediate environment, the probable consequences of this relationship are anticipated, and a process is established for selecting a number of alternatives in order to satisfy this relationship. The potential at this stage is then to invent objects, methods, institutions, and a process of selection and regulation. Owing to an accumulated knowledge of tools and their combined uses,, more and more intermediate end and

means are set between the thinker and the ultimate goals, which might still be very vague. Design solutions are empirically derived on the basis of precedence, encouraging the "evolutionary development of successively improved solutions" (Roe, Soulis, Handa, 1967).

3) planning or planned thinking, the third thought phase, is characterized by man and society advancing from the deliberate invention of single objects or institutions to the deliberate regulation and intelligent mastery of the relationships between these objects. It differs from the previous phase in that it not only thinks out individual aims and limited goals, but also realizes what effect these individual aims will, in the long run,, have on wider goals. Design goals are derived through innovation as part of the total design process (This is exemplified in Chapter Four). We are today only beginning to approach this phase with any degree of confidence,

The concept of settlement planning, therefore, has three distinct, though complementary meanings:

- 1) in its ideological sense (i.e. ends)
- 2) in its operational sense (i.e. means)
- 3) in its scope or subject matter (i.e. content)

2.2i Planning: An Ideological Definition

It is generally accepted today that settlements symbolize the development of a civilization, and that it directly reflects the particular socio-economic basis of a culture at a particular moment in history. As a corollary, it is also generally accepted that the specific objectives and content of planning change with cultural and social change. The general development of settlements as forms and as symbols can consequently be correlated to the specific social relationships at each period in history. "The social organization of life in towns is directly dependent on the social organization of society, on the social and economic environment, on the level of development of the productive forces and of production relations, and on the level of science, culture and the arts, The planning and development of towns reflects and embodies the given social phase of development, the rate of development of the cultural and other services and the formation of all aspects of life in the sphere of labour, education and recreation" (United Nations, 1964a).

For example, during the Medieval period in Europe the need for protection rose above every other concern,, After five centuries of violence and uncertainty, security became the major objective for the peoples of this period. Medieval settlements reflect this desire for security in their adaptation to the site and to the satisfaction of practical needs, such as a stable water supply. Planning utilized

the irregular, the accidental, the unexpected.

As the need for protection decreased, the problem arose of how life, growth and movement were to take place in a world governed by safety. After the 16th century the Medieval settlements tended to become a mere shell: "its economic and its social basis had disintegrated, and its organic pattern of life had been broken up" (Mumford, 1938). A similar situation can be traced through the Middle Ages, the Industrial period, and to the present day, as new patterns of existence develop.

When we talk about the prescriptive aspect of settlement planning it is necessary to define planning in terms of goals or ideologies. Therefore, settlement planning can be defined as the formulation and clarification of social objectives for the purpose of achieving a measure of self-direction in the evolution of a social system: it is a means for gaining a substantial measure of mastery over man's destiny.

2.2ii Planning: An Operational Definition

Planning is enacted by individuals whose fundamental motivations derive in part from an ideological interpretation of the function of planning in society. These motivations influence a planner's choice of problems and methods, and introduces an important normative element into planning. As an example, consider Olmsted's design in the 19th century

for Central Park, New York. The intent of this design was to provide in the city situation a brief equivalent of a visit to the countryside. The motivations for this design were quite different from those of the baroque park, which was essentially a setting for the royal palace. Olmsted became a leader in the movement to re-ruralize the town, first comprehensively set down by Messrs. Henry Wright and Clarence Stein at Radburn, New Jersey.

As a second example, the idea of the master plans or development plans crystallized in North America and Britain in the 1930's and the war years. The master plan concept was founded generally on three assumptions (Koenigsberger, 1964):

- 1) the continuation of a slow and steady rate of urban growth and social change.
- 2) the existence of a society which considered economic initiative the prerogative of the individual and relegated public action to matters of economic sub-structure and to the relief of distress. (It was assumed that economic initiative would come from private parties.)
- 3) a fundamentally conservative outlook, and a unanimous acceptance of the preservation of the achievements and institutions of the past as a primary objective of all planning. (For example, preservation of an existing beautiful country became a major concern of the planners.)

This strong Idea-action or ends-means interdependency is emphasized in the work of every planner. Planning in operational terms, can therefore be defined as the process which leads to the definition and clarification of organizational or social goals, and the reduction or development of these goals into alternative programs and courses of action.

2.2iii Planning: A Definition According to Scope or Subject Matter

It is generally recognized that the physical environment is a major determinant of social behaviour and a direct contributor to an individual's welfare. The historic concept of a city as a physical artifact is being replaced by one in which interaction and relation are emphasized.* The United Nations (United Nations, 1964a) recently stated that:

"housing and environmental development must be treated as **key** sectors in any development planning".

and

"it is the great irony of our times that, while elements of the problem (i.e. the human habitat) have been improving, the problem as a whole has been deteriorating. This point serves to show the close inter-relationship between such elements as housing, facilities, buildings, and the over-all conception of the community'*,

However, although theoretical developments are tending away from a purely physical emphasis in planning, it is still generally accepted that the settlement planner's respons-

*The works of Burgess (Burgess, 1926), Hoyt (Hoyt, 1939), McKenzie (McKenzie, 1933), Harris and Ullman (Harris and Ullman, 1945), and Firey (Firey, W., 1960), emphasize this development.

ibilities relate primarily to the physical and locational aspects of development within a local government's jurisdiction. This focus of attention seems to derive from:

- 1) the idea of environmental determinism. (i.e. The doctrine that every event is the inevitable result of antecedent conditions, and, in particular, that every human choice and act is the result of inherited or environmental factors)."
- 2) the belief that paramount values are intrinsic to the physical city. (i.e. the physical city is fundamental or basic to the highest order of human values.)
- 3) certain instrumental or "means" reasons such as to help assure that the distribution of benefits and costs among the settlement's inhabitants is consciously intended and democratically warranted; to help assure that levels and priorities of investments are so staged as to induce the desired repercussions in the private markets; and to help assure that the public resources are used for these projects and programs promising the highest social payoffs. (Settlement planning is often made synonymous with a process of decision-making and design in the elaboration of investment projects at the intra-urban level, with

*For a historical account of environmental theories, including a criticism of environmental determinism, see Franklin Thomas, The Environmental Basis of Society, New York and London, 1925.

economic development programs for sub-regional areas, and with the process of community or social development and improvement.)

It should be noted that this "focus of attention" is both inadequate and misleading for a number of reasons:

- 1) the emphasis is either on the "means" or the "ends" of planning. The Idea-action interdependency concept, and the concept of a scope or content of settlement planning is entirely lacking.
- 2) settlements are viewed as static, physical artifacts, (in contrast to dynamic, continuously growing and Changing organisms) in a natural static balance with the environment. It is assumed that man gradually adjusts to this environment,
- 3) the deterministic attitude regarding planning as a means of control.

The author, therefore, suggests that settlement planning does possess a distinct content and scope which is interdependent with the ideology and operations of planning. Chapin has suggested three contemporary definitions of "land use planning" (Chapin, 1963a) which suggest in each case a different acceptance of the content and scope of settlement planning:

- 1) the spatial distribution of city functions (e.g. residential, industrial, commercial, retail, institutional, and leisure time functional use patterns.)

2) a two-part framework:

i) activity patterns in the urban setting and their institutions as they require space (e.g. activities involved in earning a living, shopping, etc.)

ii) in terms of physical facilities or improvements to the land in the settlement which are made to accommodate these activity patterns,

3) in addition to focusing on the activity use relationship involved in 2) above, the role that value systems of people play in regulating space using activities is considered, with the use pattern emerging from these prior considerations.

It should be noted that, in operational terms, the points 1) to 3) above imply, in an ascending order of complexity, planning methods which vary from essentially descriptive, analytical and empirically derived methods to those which rely on "wholeness", synthesis, and total interactive patterns. However, this breakdown still does not define clearly the idea-action-content distinction of settlement planning.

Perhaps this distinction has been most clearly made by the group known as the Ekisticians, a group who proposes that human settlements consist of several elements:

- 1) the earth and the natural site on which they are built.
- 2) man who creates and inhabits them.
- 3) society which is formed mainly in them.

4) functions which are developed in order to allow them to survive and grow.

5) and shells (structures) which are built to transform the first and house the other three elements..

Man, society and functions are the "contents" of human settlements; nature and shell form the "container"; the interrelationship of the five elements forms the human settlements,

This classification system of the content of settlement planning appears to be the most consistent, comprehensive, and systematic definition yet to be developed to date.

2.3 Summary

Although settlement planning can be defined from ideological, operational and content points of view, it is the interrelationships of these definitions that will result in greatest, over-all appreciation of settlement planning. It should also be noted that the uniqueness of settlement planning from other planning endeavors is derived essentially from what has been termed as the "subject" or "scope" of settlement planning, and that the commonality of planning approaches is based largely on the operational and ideological aspects.

CHAPTER THREE / THE PROBLEM EVALUATED

A need is a want, lack, desire or demand felt by an individual or social group, which motivates some purposeful action (Hall, 1962). Needs are either personal or internally felt or social and interpersonally expressed. Although needs can be identified in a number of ways, it is important to recognize that actual needs are often quite different from those which are expressed,

Once a need is determined, the present state of affairs is studied in order to formulate or define the problem. This problem statement is at first very general, abstract and vague, and gradually becomes more precise through a continuous, interactive process. A problem statement establishes a definite course of action towards satisfying the needs, thereby eliminating much "blind groping in the dark" (Dewey, 1938). Roe, Soulis, Handa suggest four essential elements of the problem statement (Roe, Soulis, Handa, 1967).

- 1) a definition of the present unsatisfactory state,
- 2) a definition of the desired end state.
- 3) criteria for identifying when progress to the goal is being made.
- 4) criteria for determining when desired end state has been reached.

3.1 Planning and Research in the North: Background

The "need" in this present study arose through a request by Federal Government Officials for a planning "framework" to aid Northern settlement planners. These Officials felt that the present state of planning in the North could be improved, and requested ways in which these improvements could be initiated.

Although a preliminary analysis of the situation reveals that a relatively large number of scientific studies regarding the North are readily available, for a number of reasons these studies are of little or no immediate benefit to the planner: the studies are generally of a descriptive nature, limited to a particular scientific discipline, and lack any sense of integration, particularly in an applied sense.

A survey of the planning literature on the North, although limited, reveals that settlement planning is relatively new to the North, and that Northern settlements have generally grown through a combined "chance-discovery-inventing" process (see Sec. 2.2). The form of these settlements has generally evolved directly from the most dominant internal requirements, rather than from a socially controlled or "goal-orientated" development. The planning literature available is generally of a descriptive and solution-orientated nature; it deals primarily with post facto phenomena, i.e., products of design, the consequences of

"bad" design orientation and the attributes of "good" design orientations, Planning literature is largely directed towards non-permanent single industry settlements built "from the ground up". The development of settlements such as Kitimat, Uranium City, Lynn Lake, Thompson, and Schefferville is well documented by Robinson (Robinson, 1962), Parker (Parker, 1963), and Izumi and Arnott (Izumi and Arnott, 1956). Documentation of the development of the more indigeneous Northern settlements is largely neglected.

For a number **of** reasons, it would appear that, in a short-term, action sense, little can be gained by directly applying the planning experiences of non-permanent settlements to permanent Northern settlements:

- 1) the great difference between the economic, social, and physical structures of single-enterprise, non-permanent settlements and the more indigeneous, permanent settlements.
- 2) immitative design inherently perpetuates not only the strengths but, as well, the weaknesses of the previous designs, Immitative design also is essentially a static approach, largely negating change through time (see Sec. 2.2).
- 3) the questionable success of non-permanent settlements in meeting both physical and human needs, and consequently the validity of utilizing such settlements as models for future development (Lotz, 1962a), (Pearson, 1958,1959).

Northern planners are generally working under constraints of time, Northern experience, facilities, resources and information. Seldom is such a planner able to reach more than a very general appreciation of the ways of life in a northern settlement or a definition of the particular problem.

Planning "guidelines" to date tend to be imposed upon, rather than generated by local conditions. These "guidelines" are generally in the form of "codes" or "standards" which, although they do introduce a normative influence into planning, have the inherent disadvantage of being inflexible in a real situation.

Two additional constraints are imposed upon the problem: one is a time constraint requiring that the study be available to Northern planners as soon as possible; the second constraint requires that the study, when released, be immediately useable by planners.

3.2 What Is Required?

From the preceding analysis, a number of conclusions can be reached regarding the direction the study is to take. The requirement that the study be readily available in an operable form to planners, suggests firstly, that the study be "action" rather than "theory" orientated. Secondly, relatively large amounts of information regarding planning problem analysis (or anthropological, engineering, etc.,

studies which could be utilized in this regard) and, to a lesser degree, examples of planning "solutions" or "ends", are available to the Northern planner, What is lacking, however, is methods and procedures to fill the gap between "problem analysis" and "solutions": that is, ways or means of linking the problem with the goals or objectives, of maintaining a continuity between problem analysis and problem synthesis. It is interesting to note in this regard that although a number of planning problems have been analyzed and recommendations proposed and accepted, many of these recommendations remain unimplemented. This situation appears to result largely through the lack of adequate "means" or operational tools during the implementation stages of a project.

A third major "gap" appeared to be in the apparent lack of co-ordination of the previous studies: the studies generally seem segmented and relegated to specific disciplines. A definite need exists to coordinate and integrate these studies in a manner operationally and theoretically feasible to the planner. This is true for both basic as well as applied research and development, contrary to such arguments as: we do not possess a full comprehension of all the issues involved, In any real-life situation, decisions must be made without a full comprehension of all these issues, since the very nature of all inquiry is such that complete knowledge is inherently impossible. With a few exceptions in the realm of theory, most empirical studies reach conclusions

in order that subsequent investigations can be both better formulated and can supercede them (Lynd, 1964).

In order to keep up with the economic, social, and physical change, a fourth requirement is that planning must be based on innovation rather than imitation. Department of Industry Minister, C. M. Drury, stated recently that in an attempt to maintain a balance between basic and applied research and development, the goal of the Department is a tripling of innovative activity by the Canadian manufacturing industry (Spurgeon, 1967).

The fifth requirement is that an efficient, interacting, multiloop feedback system be established as a part of the planning procedure (Hall, 1962). This feedback system must be compatible with the planning process, and must be a continuous cyclic or iterative process (Le Breton and Kenning, 1961).

In summary, what is required is:

- 1) an action-oriented study.
- 2) a readily operable, methodological tool.
- 3) a means to integrate individual studies.
- 4) planning by innovation rather than imitation,
- 5) an efficient, interacting, multiloop, feedback system.

These five considerations constitute what is accepted as the problem definition of this study.

CHAPTER FOUR / BASIC CONCEPTS

The phenomenon of human settlements, by nature, is highly complex and probabilistic. The large number of component "parts" of a settlement and the complex interrelationships of these "parts" disallows strict mathematical or analytical formulation. Methodological approaches for observing, analyzing, diagnosing, or perhaps intervening in, these phenomenon of the human settlement must, therefore, allow for multidisciplinary participation and multi-dimensional analysis,,

With the general rejection of the concepts of environmental determinism (i.e. the idea that human behaviour is predictable in terms of the physical environment), cause--effect relationships, and normative laws, the idea of the "uncertainty principle" or "probabilistic" laws are being more and more accepted (Meinig, 1962), (Morrill, 1963). The behaviour of settlements is now viewed as neither wholly rational nor wholly chaotic and unpredictable, and their interaction is viewed as highly non-deterministic. Von Neumann and Morgenstern's game theory formally introduced this "uncertainty" principle into economics through the mathematical theory of games (Von Neumann and Morgenstern, 1944). In Neyman's growth theory, chance or stochastic (meaning "aim" or "guess") processes played a major part (Neyman and Scot, 1957). Hagerstrand, in Sweden, has begun work on the application of stochastic Monte Carlo models to migration

(Hagerstrand, 1953; Morrill, 1963).

Because of the complexity and probabilistic nature of problems of human settlements, such problems are best suited to the methodological approach of systems analysis and to the concepts of a team approach. Section 4.1 following presents concepts relevant to and the benefits to be gained from using a "system" approach to settlement planning. Section 4.3 explains the concept of a planning team.

For half a century and more settlement planning has been absorbing new objectives - beautifying the city, efficiency in the provision of public services, changing and revitalizing the urban core. Now we have reached a state where social forces are giving us new and vivid indications of what really matters in our settled areas. These indications create, at the same time, a more serious need for settlement planning to relate itself conceptually to these meaningful issues, and to devise new techniques and organizational arrangements which will permit it to move more powerfully and comprehensively among the public and private groups involved. Recent conceptual and methodological developments in a number of general "design" fields have opened up the possibility of scientific programming, and has tended to shift interest from descriptive cross-sectional studies of settlements to ambitious growth models using highly sophisticated, simulative techniques. Meier has recently exemplified that viewing the city as a communications system rather than as a set of buildings

connected by roadways carrying vehicles, could profoundly alter settlement planning concepts (Meier, 1965). To date his work indicates that information is an important value index for the ordering of human affairs in settlements. Work in the management sciences, particularly in operations research, has produced some significant design techniques. The ecologists, ethnographers, and economists have also contributed significantly to the general body of design theory and methodology.

Nevertheless, these approaches are still partial and idealized: they represent separately objectives which cannot be fully attained simultaneously or techniques with no ideological interdependency. What is required is a framework to maintain these objectives and methodologies in a balance: to combine a theoretical concept and an operational method with a systematic exposition. The concept of planning as a continuous design process is presented in Section 4.2 as an attempt to provide such a framework.

4.1 System

Systems analysis was first developed and utilized to analyze and describe physical phenomena of the natural environment (Bertalanffy, 1951). Within the last decade, various disciplines have increasingly extended the concept of a "system" to include economic and social phenomena (Hall and Fagen, 1956; Chin, **1964**; Ellis, 1965; Miller, 1965). Although the "system" concept is regarded by some theorists as universally applicable to physical, economic and social events, **and** to human relationships in small or larger units, there is really no consensus regarding the utility and meaning of "system". Work by Simon (Simon and Newell, 1956) formed an integral part of an approach to a general system theory based on broad analogies between the frequency distribution of a wide variety of biological, social, and economic phenomena. More recently, a general acceptance has developed that certain characteristics are common to all systems. Roe, Soulis, and Handa have suggested a number of these characteristics of systems (Roe, Soulis, Handa, 1967):

- 1) a system can be classified according to function, size, predictability, internal characteristics, purpose, or in terms of the various mathematical models which may be used to characterize them.
- 2) system components are chosen on the basis of contributing directly to the operation of the system, They should be discrete entities, representing the

same level of generality. The components selected can be individuals, social groups, roles, acts, expectations, desires, communications, influence and power relationships, and so forth, and do not necessarily have to represent physical entities.

3) components which are clustered hierarchically, according to some predetermined criteria, form sub-systems.

4) in order to understand a particular system, a sufficient amount of knowledge regarding this system must be available.

5) the interconnection of components imposes restrictions, or constraints, on the functions of the system.

6) the system concept can be used for both the analysis or the synthesis of a design or planning problem. That is, it can be used for the purpose of observing, analyzing, and diagnosing a situation, or for intervening and controlling a situation.

Basic to the "systems" concept is the acceptance that within natural phenomena there exists organization, interaction, interdependency, and integration of parts and elements."

*"Lancelot Law Whyte, a noted physicist and philosopher, states that "Nature is not a chaos of particles, but a process which consists in the development and transformation of patterns (such as are evidenced in the structure of molecules, crystals, tissues, organs, and in organisms and their behaviour patterns). If there were no patterns in the world, the mind could make no sense of it (Whyte, L. L., 1948)."

System analysis "assumes structure and stability within some arbitrary sliced and frozen time period" (Chin, 1964). Impinging upon the system is the environment, composed of all the factors which are placed outside the system,

The settlement is then identified as a density configuration that is measured by the flows of interaction within a given "field". This field, however, has no firm boundaries, but represents a continuum of densities of interaction, where the actual lines of division become more or less arbitrary symbols put down for convenience. The boundary does not necessarily comply rigorously with the structural aspects of the actual situation: it may exist physically, in the sense of a topographical feature such as a range of hills; it may also be delimited according to what components are being focused upon, such as non-local native children, administrators, wild animals or single-family dwellings.

The operational definition of a system boundary is "the line forming a closed circle around selected variables, where there is less interchange of energy (or communication, etc.) across the delimiting line than within the delimiting line" (Chin, 1964). The multiple systems, or subsystems, of a settlement generally establish non-coincident boundaries. For example, within the Mackenzie River Delta, the boundary defined by the activity pattern of a school-child would differ from the boundary defined by the activity pattern of a hunter. However, in order to expedite the analysis, a boundary is tentatively assigned and readjusted if necessary,

In this way one can examine explicitly whether or not the "relevant" factors are accounted for within the system; Also, by placing arbitrary boundary limits and temporarily neglecting selected factors, the problem can be maintained at a manageable size, The "neglected" factors can be introduced at will.

"Each organism has its own line of growth, that of its species, its own curve of development, its own span of variations, its own pattern of existence. To maintain its life-shape the organism must constantly alter it and renew itself by entering into active relations with the rest of the environment" (Mumford, 1938). This quotation introduces three more important concepts of the systems approach: tensions, equilibrium,, and feedback.

Since components within a system are different from each other, in the sense of being not perfectly integrated, these components are continuously changing and reacting to change. "Outside" disturbances are also continuously occurring.

These differences lead to varying degrees of tension within the system. Two or more opposing components create a conflict or incompatibility within the system; Tensions lead to activities of two kinds: those which do not affect the structure of the system (dynamics), and those which directly alter the structure itself (system change).

Living systems tend to maintain steady states of components,, keeping all sub-systems in an order of balance both with

one another and with their environments (Miller, 1965). These steady states are described in terms of entropy, in accordance with the second law of thermodynamics, in which entropy is a state of randomly distributed energy, and, essentially, a "normal" or "average" state of equilibrium. Settlement problems can, therefore, be treated as average conditions, in correspondence with both general systems theory and the nature of human settlements. A continuous environment-system interaction occurs, through which a system gathers information regarding its state or condition. When fed into the system, this Information acts as input to guide or direct the operations of the system. This process is called feedback,

Maruyama has speculated about an apparent contradiction of the second law of thermodynamics in social phenomena, including those of settlements (Maruyama, 1963). He points out that cybernetics, the study of equilibrating systems, considers many cases of self-regulation such that deviations are counteracted and the system is brought back to its equilibrium. But many instances can be cited in which feedback does not lead to self-correction towards some pre-set equilibrium (morphostasis); rather, progressively greater Contrasts appear. Such deviation amplifying processes (morphogenesis) run counter to the second law of thermodynamics. Maruyama concludes that any system, together with the sub-systems into which it may be partitioned, contains many examples of both deviating-correcting and deviating-

amplifying processes. One sub-system may be becoming more highly organized, another may be approximating its most probable state.' To understand the system as a whole demands that each of the sub-systems be understood, as well as the relationships between them,

As a methodology, systems analysis offers significant advantages and possibilities to a designer or planner:

- 1) it produces a tendency to look in an orderly way for relationships where one might not normally look for relationships: the error of simple cause-and-effect thinking is avoided.
- 2) it makes you search your mind to be sure that what you think you know, you indeed do know.
- 3) it allows for interdisciplinary interaction on the basis of small, manageable "bits" of information.
- 4) it allows one to justify what is included in the observation and interpretation of information and what is temporarily excluded.
- 5) it allows one to predict from a "total" or "holistic" viewpoint what will happen if no new or outside force is applied (i.e. if events are left undisturbed) and vice versa.
- 6) it allows one to categorize what is relatively enduring and stable, or what is changing in the situation,,
- 7) it allows one to distinguish between what is basic to the system and what is merely symptomatic.
- 8) it allows one to distinguish between controllable

and non-controllable variables.

9) it attempts to consider all the principle elements of a problem and all the main ramifications of any number of courses of action.

4.2 Planning As A Continuous Design Process

4.2i General Considerations

Recent contributions from a number of disciplines and covering a wide range of problem "types" have added significantly to the concept of planning as a continuous design process. Some of the studies are concerned with defining the creative process (Shahn, 1957), (Gordon, 1961); others are concerned with the relationship between particular personality traits and the effect of these traits on the design process, or on the relationship between problem-solving and the problem-solving environment (Barron, 1963), (Newell, Shaw, Simon, 1964); and still others attempt to determine the stages or operations of the design process, and the implications and results of each of these stages (Polya, 1957), (Asimow, 1962), (Hall, 1962), (Gosling, 1962), (Jones, 1963), (Alexander, 1964a), (Rae, Soulis, Handa, 1967)*.

The concept of "process", therefore, has both a technical and a behavioural usage (Chapin, 1963a). **It** is essentially

*This basic classification of the planning process was suggested in (Heckler, 1966).

the latter concept which is **of interest** in this section, That is, what is the nature of the planning function; what are the operational characteristics, the continuous actions, which bring about a particular "planned" or "designed" result?

The process of planning is, in general, regarded as one which leads to the formulation and clarification of goals, priorities and standards, and to their ultimate reduction to specific courses of action, programs and projects. While such a process may in detail take various forms, it generally has the following characteristics:

- 1) it begins as a selective, simplified, and orderly arrangement of the abstract structure of a real situation. These arrangements are then manipulated so as to provide a deeper look into reality itself.
- 2) an attempt is made to provide the closest possible structural, functional, and dynamic correspondence between the real-life problem and the abstract process devised to solve it,
- 3) planning is thought of as a series of synchronized, complementary and supplementary choices or decisions, involving complex quantitative and qualitative information. The planning process is viewed as a continuous, integrated network of ideas and actions.

Settlement planning has traditionally been done best by those who could intuitively handle complex interrelationships and interactions of a multiplicity of factors. Evidence

indicates, however, that the point has already been reached where it is impossible to intuitively know or comprehend the implications of planning decisions, the ramifications of which are extremely significant, Herbert A. Simon states that: "The capacity of the human mind for formulating and solving complex problems is very small compared with the size of the problems whose solution is required for objectively rational behaviour in the real world, or even for a reasonable approximation to such objective rationality" (Simon, 1957). It is generally being accepted that the traditional stages of the planning process - such as survey, plan and implementation, seen as a continuous, closed looped system - are inadequate as organizational and operational tools; that the attributes of "common sense", intuition and practical experience alone can not meet the complexities of a modern society. Planners, therefore, require assistance in the decision-making process.

4.2ii Contributions In The Settlement Planning Field

In the field of settlement planning, a number of studies have attempted to systematize and organize the planning process into logical sequences and methods, following the various practices and procedures of contemporary planning. The United Nations suggests five stages in the preparation and realization of a plan, two preceding and two following the preparation of a physical plan:

- 1) general policy decisions.

- 2) the careful formulation of a problem.
- 3) the determination of the lines of the physical plan,,
- 4) the execution of the five stages of the plan.
- 5) the maintainance, adjustment and extension of the plan.

They suggest that "some continuity must persist throughout this sequence", and that, "there must be cooperation between the technical groups that formulate the plan and those who execute it" (United Nations, 1964b).

Dr. Demetrius S. Iatridis, Director of the Graduate School of Ekistfcs in Athens, suggests that the major activities of social planning are: collection and analysis of data; policy-making; programming (i.e. the sequence of goals and activities, resource needs, and time schedule); design of plans and programs; evaluation and feedback, from operations to research to data collection. He states that "social planning needs a powerful operational, comprehensive framework which can provide guidance to its major activities" (Iatrfdis, 1964).

Chapin suggests that in planning the sequence of action falls into these stages:

- 1) goal specification stage
- 2) decision-making stage
- 3) plan execution, evaluation, and reorientation stage.

He views these three stages as occurring "in cycles which proceed in a circular rather than in a straight-line sequence, with one sequence of action moving into a second,

and a second moving into a third, and so on" (Chapin, 1963b).

Jones indicates that there exists a potential conflict between logical analysis and creative thought. He states that: "The difference is that the imagination does not work well unless it is free to alternate between all aspects of the problem, in any order, and at any time, whereas logical analysis breaks down if there is the least departure from a step-by-step sequence. It follows that any design method must permit both kinds of thought to proceed together if any progress is to be made" (Jones, 1963). He proposes a technique which is primarily a means of keeping logic and imagination separate by external rather than internal (i.e. within the mind) means.

Alexander proposes an approach based on the functional origins of a problem. (Alexander, 1964). He states that the main purpose of the problem-solver is to achieve fitness between two entities: the form in question and its context. He defines form generally as the part of the world over which we have control, and context as the part of the world which puts demands on this form; fitness is a relation of mutual acceptability between these two. Since the form-context boundary is determined by the problem solver, the problem to be solved, and change through time, this boundary is always unique.

It is impossible within the scope of the study to evaluate the spectrum of planning approaches. They vary from the

very standard survey-analysis-plan procedure, through to theoretical design, form from first principles and how this must be adapted to reality, to studies of particular aspects in depth then considering what emerges when they are placed together, through to approaches visualizing the end result of the study beforehand and planning accordingly by network analysis, and so on. In general, however, the above approaches are either "ends" or "means" directed, and do not embody the idea-action-content interdependency concept (see Chapter Two). In fact, many approaches view action, (or the "political process"), and idea, (or the "planning process"), as dichotomous. It is the intent of the following section, therefore, to develop a planning approach which, in a process sense, incorporates the ideas presented in Chapter Two.

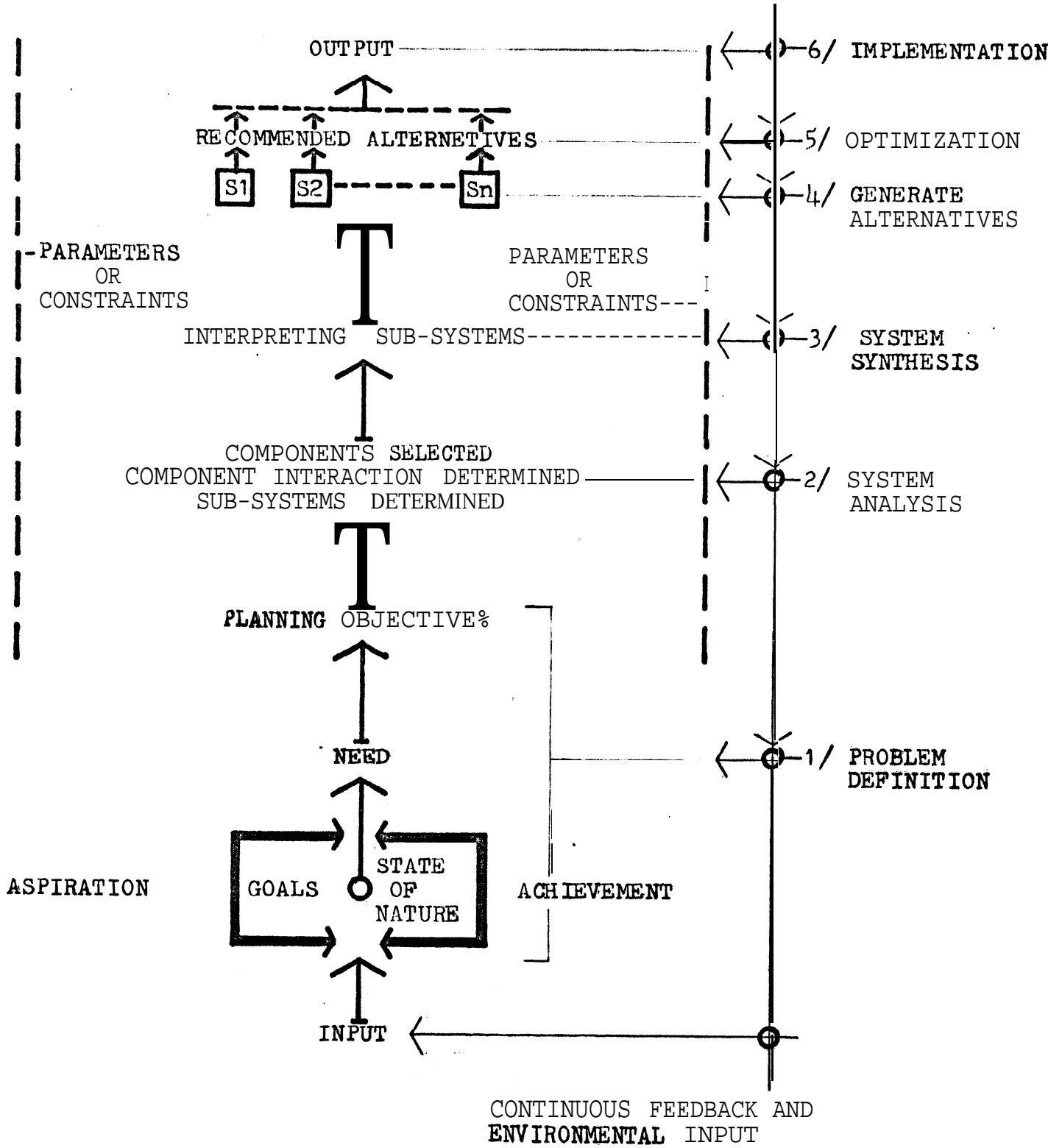
4.2iii Planning Process Proposed

The planning process proposed in this study is summarized in the figure on the following page. In order to maintain an idea-action-content interdependency, an attempt is made to embody in this planning process the systems concept and the theoretical basis for settlement planning. For the sake of convenience, the approach can be categorized into a number of stages or phases:

Phase One

Problem definition may be seen as the collection and

figure 4.a DIAGRAM OF THE PROPOSED PLANNING PROCESS



analysis of information for the purpose of identifying a real-life situation: of identifying an array of "states of nature", (i.e. the present state of affairs), as a direct response to the identification of an array of "goals" or "objectives" of a society (i.e. ideas, desires, feelings, expectations).

Like any other human activity, planning must have its goals or objectives, its impetus, purpose or direction, in order to reach a new and more desirable state. Mumford suggests that: "The strongest social organizations and social pressures, without such well-defined goals, dissipate their energies in uneasy random efforts occasioned by passing opportunities. No goal, then no direction: no underlying plan, no consensus, then no effective practical action" (Mumford, 1938). However, planning goals as defined by the planner, governing bodies, or a particular culture, society, or individual, are likely to differ. It is therefore necessary to identify as comprehensively as possible the array of planning goals. Since settlement planning in a democratic society has a primarily social, (rather than an individual), responsibility, it is necessary to concentrate essentially on collective goals.

The states of nature may be viewed as including both physical phenomena and human relationships or activities.

Information is gathered from five major sources (Levin, 1966):

- 1) knowledge of user requirements: the behaviour and characteristics of people in existing environments.

- 2) knowledge of practical limitations.
 - 3) conjecture (imagination, inventiveness, or creativity) .
- Recent developments suggest a number of ways of stimulating conjecture, and the advantages of these techniques in relation to the design process (Gordon, 1961), (Jones, 1963).
- 4) knowledge of previous designs.
 - 5) the processing of other information within the design process itself (i.e. the discovery of the interrelationships of the information) .

Problem evaluation involves the comparison of respective states of nature to goals; resulting discrepancies or inconsistencies indicate "needs". That is, needs represent a gap between aspiration and achievement.

From these needs are formulated an array of "planning objectives". These objectives may be viewed as performance standards, parameters, or constraints which the respective states of nature must meet, and which indicate when progress is being made in the overall planning process.

Phase Two

System analysis involves identifying an array of components of the system and determining the interaction of these components. The purpose of this array or ordering procedure is to stimulate and hopefully extend a planner's thought and creative capacity.

In setting up this array the possible choices of components are infinite, since the definition of component parts is dependent essentially on the planning objectives and the planner's personal capabilities, relative to the real-life functioning of the settlement. The components can represent human relationships, (such as roles, acts, expectations, desires, communications, influence, power),, individuals, social groups, physical entities or parts, economic phenomena, and so on. In order to maintain the necessary consistency throughout the problem, the criteria or basis for selecting the components and the meaning of each component must therefore be explicitly stated.

Once a list of components has been selected, the next step is to determine the interaction between the components. The systematic approach is to use charts, to ensure that all possible interactions are discovered, and computerized techniques to expedite the process. There are many mathematical and non-mathematical methods of doing this. Two relatively elementary methods, which have very wide applications in the finding of relationships in randomly assembled information, are used here: matrix analysis and factor analysis.

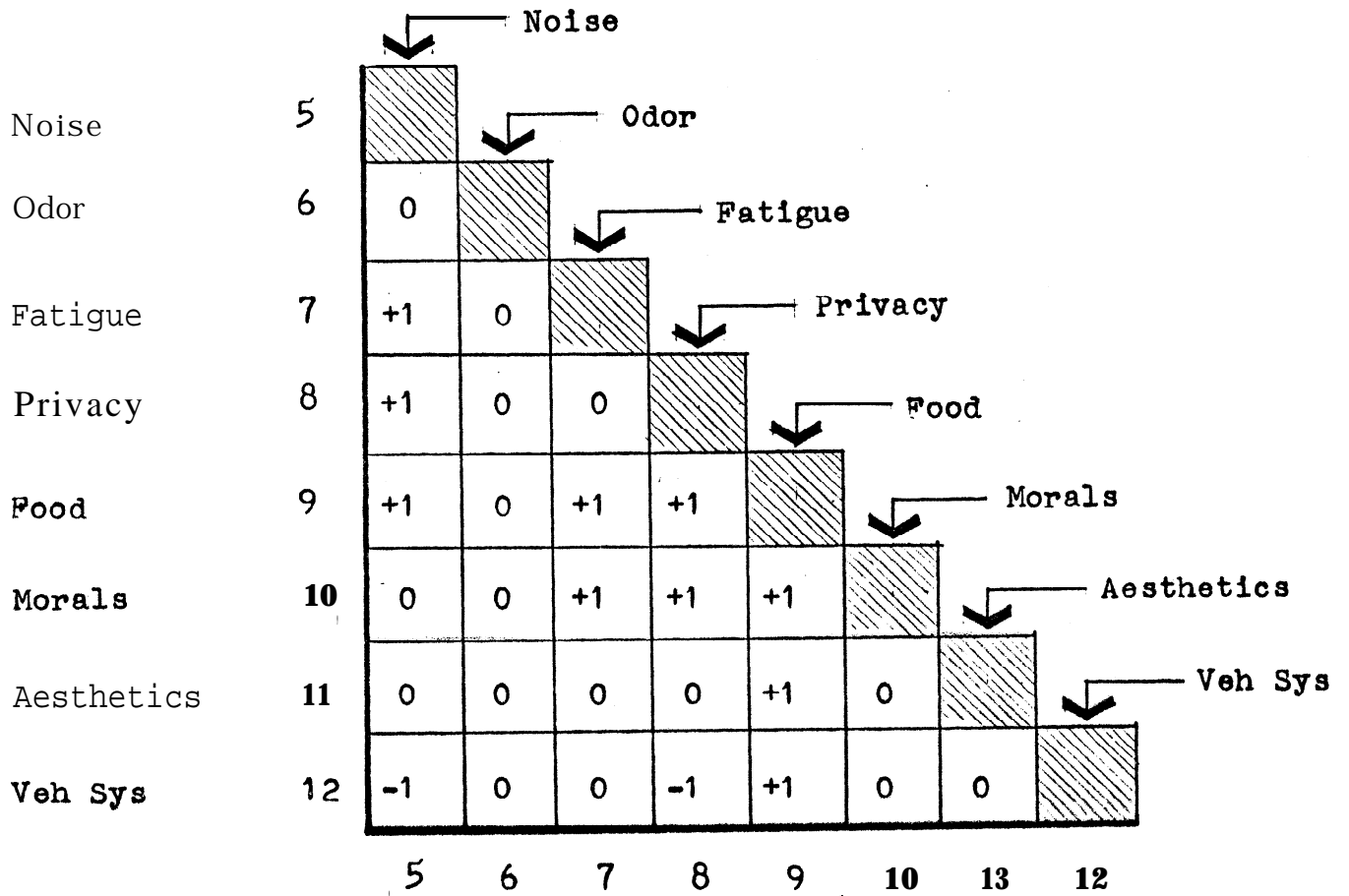
A matrix consists of one vertical column and one horizontal row for each component. Each pair of components is considered separately, and when an interaction is found it is denoted, (with a scale indicating the relative degree of interaction or importance), in its particular location on

the matrix (refer **to** figure 4b on the following page). This model is particularly useful for the analysis of large quantities of data in situations where there are no strong hypotheses or a priori expectations. In this method, all components are intercorrelated and the matrix of relationships is examined for significant patterns. Each matrix interaction pattern will vary according to the criteria used to define interaction; and since the criteria for interaction is directly dependent upon the purpose a planner considers the matrix to have and the components making up the matrix, each pattern will be unique.

For example, if the purpose is to describe a real-life situation, the criteria for determining interaction might be based on the observable physical, social and economic functioning of the settlement. Analysis of a matrix constructed with such criteria* would provide an explanatory ordering of the real-life situation: it would yield component interrelationships not immediately obvious to the planner. In this way, the planner is aided in grasping the significance of the particular situation. On the other hand, if the purpose in utilizing the matrix is to aid the planner directly in the decision-making process, the criteria for component interaction might be the desirability of a range of settlement attributes by a number of social groups. The components would then represent less physically-recognizable

*For an example of a settlement planning study on this basis see Wright, 1967.

figure 4b.

REPRESENTATIVE SAMPLE OF MATRIX INDICATING COMPONENT INTERACTION

and more abstract data; data including not only the planner's judgement regarding the feelings and aspirations of these social groups but also their own direct decisions, The interaction matrices can now be directly used to establish sequences, groupings, and order of importance of components, This, however, is an extremely slow and tedious manual procedure, and becomes completely unmanageable for matrices with a large number of components, A factor analysis technique is therefore utilized. This technique, according to a predetermined program, automatically extracts from the information contained in the interaction matrix, component groups with similar interactive patterns. These similar interactive patterns constitute "factors" or groupings of significant importance to the overall problem. The factor can be viewed as sub- or smaller-problems of the overall problem; or as sub-systems of the overall system. These sub-problems are derived from the structural, functional and dynamic relationships of the real-life situation. This approach is, therefore, consistent with the concepts of a system and of bringing problems within the possibility of rational human comprehension, without destroying the integrity of the total problem.**

*As a rough estimate, this would probably mean a matrix which has more than twenty components,
 **It is interesting to note Levin's suggestion that a designer's response to the complexity of design problems seems to be to break them down into sub-problems that he can handle; and that one way a designer does this is by grouping a number of component "parts" or "bits" of information together, Levin suggests that in a traditional planning approach this is exemplified by the practice of zoning for various uses: that zoning offers convenient categories which, however, are divorced largely from the real-life situation (Levin, 1966).

The factor analysis solution can be used to construct a "factor array" for each matrix. These factor arrays represent synthesized groupings of components arranged in successive order or classes, each of which is subject to or dependent on the one above it, and each of which represents typical sets of interaction patterns.

Another operation of the factor analysis technique is a procedure which indicates for each matrix the significant factor breakdowns or sub-problem levels,, This particular sub-problem structure can be indicated by plotting on a graph the "eigenvalues" of the correlation matrix in the computer output. Discontinuities in the graph indicate the sub-problem levels most significant to the overall problem." (This technique will be exemplified in the following chapter.)""

*This method represents only one of many different tests for determining the significant factor breakdowns. However, it should be noted that in this study the validity of this method was supported by;

- 1) selecting the significant factor breakdowns according to a subjective evaluation; and
- 2) plotting every factor breakdown according to its hierarchical linkages, (this procedure is explained in the following section), and determining the significant breakdowns from the groupings of these linkages.

The author discovered that each of these three procedures yielded essentially the same solutions,,

**For greater detail regarding factor analysis refer to (Worst, 1965), (Danbury, 1962), (Thurstone, 1947). For the specific factor analysis program used in this study refer to (Wright, 1967).

Phase Three

System synthesis involves restructuring and interpreting the factor arrays. The pattern of relationships between a number of interacting factors can be made easier to see by replotting the information from a factor analysis as a network diagram. The results are exemplified visually, a language most planners and many other disciplines easily understand. This is an important characteristic of the network technique.

With this technique, factors are combined with those factors with which they show the greatest correlation to form a set, cluster, or grouping. By displaying the sub-problem levels consecutively, the various component groupings (i.e. factors) and interlevel-linkages can be shown. This is achieved by linking, (i.e. joining with a line), factors with similar component structures, by following four general rules:

- 1) factors are transferred from one sub-problem level "x" to the next sub-problem level "y" if any factor in "a" in level "x" has identical components to any factor "b" in level "y". Factors "a" and "b" are then joined with a solid line,
- 2) new factors are formed if the components for any factor "c" in sub-problem level "y" have not appeared together in any previous (beginning with the one factor solution) sub-problem level. This factor "c" is not linked to any factor in any previous sub-problem level.

3) when only part of the components of any Factor "b" in sub-problem level "y" are transferred to the following level "z", this "part" factor "d" constitutes a factor sub-group of its related factor "b" in the previous level "y". This creates a "branched" linkage pattern.

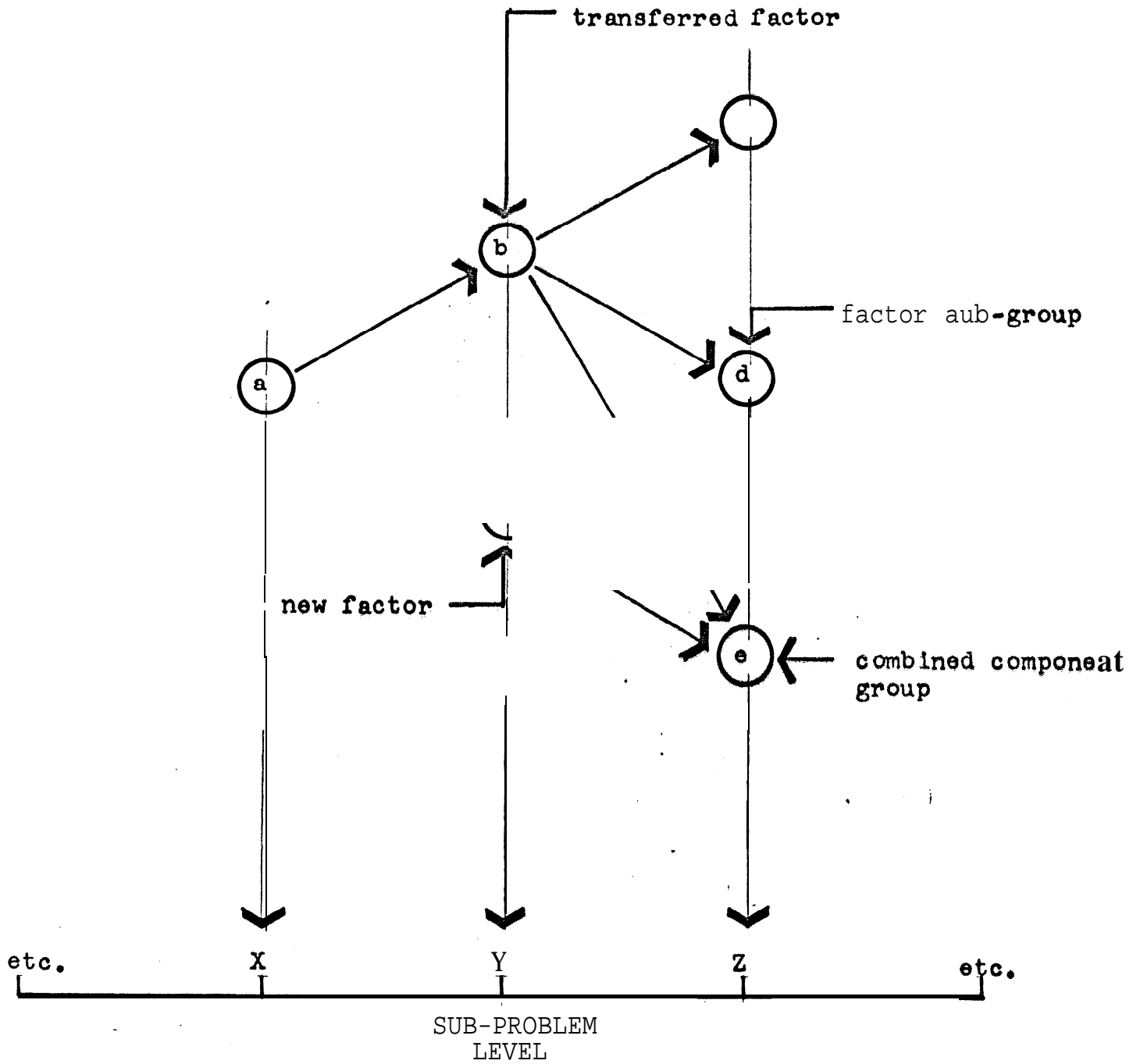
4) when parts of the components of any two or more factors "b" and "c" of sub-problem level "y" are transferred to one factor "e" in the following level "z", this indicates a combined component group "e". When this factor "e" is linked to the factor "b" and "c", a lattice pattern is created,

The figure on the following page exemplifies these rules. This concept will be expanded further in section 5.3i.

Phase Four

Alternative restructurings, designed to meet the performance standards set by the planning objectives, are formulated as an array of proposed alternative "solutions". Because of the continuity of change and the inherent goal conflicts in any collective human endeavor, reaching a unique optimum solution directly is extremely difficult, if not impossible. Under these circumstances, the success of the planning process depends upon being able to generate a wide variety of alternative solutions, and upon being able to easily and flexibly combine these solutions. By increasing the spontaneity of the design process, the tediousness of generating a large number of alternative

figure 4c

DIAGRAM OF INTER-LEVEL LINKAGES

solutions by traditional techniques, and the limitations imposed by a designer's personal attachment to particular solutions, is lessened in the proposed methodology. Further advancements, such as a direct, graphic computer output of alternative solutions could result in a more spontaneous design process.

Phase Five

"Optimization presupposes the existence of some criterion against which the value of a design can be measured?" (Roe, Soulis, Handa, 1967). It can be defined as the process of securing the best system-environment fit according to some specified overall design criterion in the problem definition phase of the planning process. A number of tools such as dynamic programming, the theory of games, nonlinear programming, and physical or graphical models become extremely useful at this phase.

If factors are solved or synthesized as separate sub-systems, they may subsequently prove not to be consistent with each other. The resulting solutions represent a sub-optimization of the system. As was earlier pointed out, there is no "ultimate" solution to a settlement planning problem. The "probabilistic" nature of a human settlement requires that many decisions be made in the "face of uncertainty" (Hall, 1962). To date no optimization procedure is capable of handling with any degree of accuracy decisions regarding such problems, The most common approach combines

experience, knowledge and direct judgement with the intuition of the planner,

However, Meyerson-Banfield have proposed an approach which will be adopted for this study (Meyerson, Banfield, 1955). The approach involves a three-part sequence of steps to decision making:

- 1) consideration of all action alternatives within the framework of conditions that prevail and goals sought.
- 2) evaluation of the consequences following from the pursuit of each action alternative, including the change of conditions predicted and the extent of goal achievement anticipated; and
- 3) selection of the alternative(s) that in the light of consequences and in consideration of goals is the most preferable course of action.

Phase Six

Although settlement planning arises out of human needs, its implementation is political, and involves governmental bodies at all levels possessing different degrees of political authority. The political process is the means by which a community's hopes and aspirations are translated into action. One cannot expect political leaders and citizens to understand the complex technical matters involved in settlement planning. It is therefore the duty of the planner to present to the citizens and the political authorities, in a comprehensive manner, the various characteristics,

advantages, and disadvantages of a number of alternative solutions or combination of solutions. Clear cut decisions require clarity in objectives and unambiguous criteria, as well as some certainty about the implications and repercussions of alternative choices, Solutions are feasible only if they are consistent with the goals and limitations of the community.

The concepts of iteration and simultaneity apply at all stages of the approach. Each phase in the sequence of six phases is continuously initiating action (i.e. output) or is being modified by the results of action (i.e. input). This modification is not merely a more efficacious employment of means to an originally intended end, (i.e. a continuous adjustment on the feedback principle), but also a modification of the end in view, a revision of intention, a change of desires, a development in understanding. Settlement planning must, therefore, be viewed as a cybernetic process of moving towards goals rather than a vision of an ideal state. Each planning phase becomes a general "field" of activity rather than a discrete entity.

The concept of planning as a continuous design process has a number of inherent advantages over the more traditional, purely intuitive planning approaches:

- 1) it allows greater efficiency in the utilization and manipulation of design resources.
- 2) it makes public the procedures, responsibilities, and progress of planning endeavors, thereby allowing for

greater public participation.

3) it encourages multidisciplinary participation and delimits the role of the individual participants in relation to the total planning process and in accordance to defined goals and objectives,

4) it tends to make apparent personal biases or deficiencies. It, therefore, encourages objectivity.

5) it allows for a more comprehensive approach within its general structuring frame.

6) accepting that the cognitive capacity of a human being is limited, it allows one to extend this cognitive capacity.

Although the approach offers definite advantages, certain disadvantages common to most methodologies should also be noted:

1) simplifying or exaggerating the complexity of a situation in order to fit a predetermined methodology.

The approach must always be a tool and not an "end".

2) for the sake of comprehension and convenience, the approach is generally explained in terms of stages or sequences of development,, A tendency is to create distinct boundaries around each of these categories, often in order to relate the problem to the subject matter, organizational arrangements, and operational techniques of a particular discipline. This, however, is entirely contradictory to the idea of structuring the problem according to the needs of the real-life

phenomena.

3) following the methodology requires a great exactness, honesty, and consistency by the user. If this exactness, honesty, and consistency is not maintained, the methodology can become a "front" (i.e. end) for personal biases.

4.3 Multidisciplinary Planning Team

"The difference of approach by prophet and sage to common moral and social problems determined alike their functions and spheres of activity. The prophet's task was to make known the knowledge of the Lord; the sages to show how this knowledge was to be applied in terms of daily life and conduct. The prophet attacked the moral problem from the top: his attention was directed to the conduct of rulers and leaders. The sage attacked the problem from below: his interest was in the man-of-the-street, whom he recognized as the source of all ethical development? (Epstein, 1959).

In order to be effective in terms of development, planning must be comprehensive in scope and organization, with "economic", "social", and "physical" planning integrated into one total process. Such an approach is, however, possible only within the framework of a planning "team". This team, and its organization, is therefore very central to the success **or** failure of a comprehensive planning approach in the Mackenzie River Delta,

4.31 Rationale of Team Approach

The problem of making operational the concepts embraced by

a comprehensive planning approach are well beyond the professional capacity of any particular individual or director. Although the individual can restrict the program to those aspects of the work that lay within his grasp, the results reflect directly not only the strengths but equally the weaknesses of the individual in charge. Alternatively, one may undertake to meet the complex problems on their own terms, deliberately exceeding the reach of any single member of the staff, but endeavoring to assemble a team of staff and consultants combining the essential capabilities.

Group interaction may, by bringing extra minds to bear on the problem, overcome difficulties an individual sees no way around, offer new opportunities for synthesis, and generate more balanced and penetrating criticism. In the same way, however, group interaction also increases the number of "means" or "procedure" unknowns to be dealt with, thereby creating the possibility for the group's activities to be equal, or possibly less effective, than those of one person. This, therefore, presents the problem of creating a comprehensive Organizing framework in order to offset the potential problem.

By representing an integration or unification of knowledge, a multidisciplinary team approach provides a practical means of assembling a viable group capable of making a major contribution to a particular topic. Although more and more "new" disciplines are today participating in the planning process, for a number of reasons there exists a great lack of balance

in the membership, organization and effectiveness of the team effort:

- 1) differences in aims and methods of education.
- 2) differences in the character,, responsibilities and attitudes of various professional institutions.
- 3) differences of approach towards the solution of design or planning problems.
- 4) the increasing variety of tasks to be co-ordinated and the widening range of knowledge to be absorbed,
- 5) an inadequate appreciation of the need to act as a team, and of the techniques to make this teamwork effective,

This sense of "fragmentation" is evident even within the more-closely related planning "disciplines". For example, consider the concept of planning space. Probably the most familiar concept to the planner is the physical or geographic space, such as might be shown on a land use map. Superimposed upon it, and not necessarily isomorphic with it, are at least three categories of non-physical space: perceptual, economic, and social. Perceptual space is defined by an interaction process between the observer's mind and physical reality; it is the space of Kevin Lynch's "image of the city" (Lynch, 1960). Economic space is defined by "forces" of economic influence and patterns of interaction among economic "actors"; it is the space of trade centre analysis, the space which for Jean Gottman defines the essence of megalopolis, and which allows one to distinguish, for example, "depressed peripheral" from "core" regions (Gottman, 1961).

Social space, finally, is defined largely by individual and group interaction processes as determined by values, beliefs, and attitudes; it forms the subject matter of human ecology and on a small-group level has been studied by Kurt Lewin (Lewin, 1951) and Amos Hawley (Hawley, 1950), among others.

Around each of the basic spatial concepts mentioned is evolving a distinctive planning specialization: purely physical space is central to the thinking of the ecologically-minded landscape planners and the geography-orientated physical planners; perceptual space is increasingly the focus of the urban designer; economic space is a major working concept for the regional planner; and social space appears to be the basis for an emerging breed of social planners. Each specialization has its own analytical frame of reference, its own basic disciplines on which it leans most heavily for support, and its own vocabulary and methods. As these specialized planning approaches increase in number, it becomes an increasingly mammoth problem simply to create lines of communication between these emerging specializations. These disciplines are limited either to the consideration of particular features of the settlement - as in the case of architecture which is concerned largely with buildings -, or to certain facets only of the over-all problem - as regional science, which deals with only on the macro scale with essentially the economic phenomena of settlements. Doxiadis suggests that "what is needed is a far more scientific attitude to the problem of this highly complex phenomena, the

human settlement", and that "it is a mistake for our approach to be narrowed down by the limits of each science, or by individual techniques or arts" (Doxiadis, 1964).

4.3 if Team Organization

A "group" or "team" is a reality only when it has a perceptible contiguity and some ordering principle, whether it is imposed authority, accepted leadership, or a common sense of purpose. However, in order to be most effective within our particular society, in terms of both operation and solution, a team effort must also be characterized by certain very basic principles: mutual respect, understanding, interaction, and collaboration: characteristics unlikely to be achieved under the principles of either "imposed authority" or "accepted leadership". A planning team effort must therefore be based on the ordering principle of "a common sense of purpose",

The planning process proposed (see Section 4.2iii) **offers** such an ordering, integrative framework, a framework which allows the discipline linkages to be determined according to a common hierarchy of values and implementation procedures, formulated according to each specific, real-life situation. With this approach,, sub-problems conform to subsystem divisions, and the team effort is organized to most effectively solve each sub-problem; the role of each discipline in the planning process is determined according to the "idea-action-content-interdependency" of this discipline

(see Chapter 2). This can be best exemplified by categorizing the relationship of a number of team members to each phase of the planning process under the general considerations of:

- i) ideas - the ends or goals of each phase of the planning process.
- ii) actions - the means, methods, techniques or procedures, (and their characteristics), which can most effectively implement each phase.
- iii) content - the scope or subject matter considered to be within the context of the problem. Since the content is directly dependent upon each particular problem, it can be defined in only very general and comprehensive terms.
- iv) team members - the participants involved in identifying and solving a particular problem.

Figure 4d on the following page outlines this procedure.

It is meant only as a very general working guide in establishing the team effort,, and must be adapted to each real-life problem, as well as to changes through time (such as, increased knowledge and changes in attitudes and goals).

Each team member relates to the particular planning endeavor on the basis of his ability to best contribute to:

- i) the content relevant to the particular situation; and
- ii) one or more of the planning phases in the problem-solving process.

The role of each member of the planning team, then, is

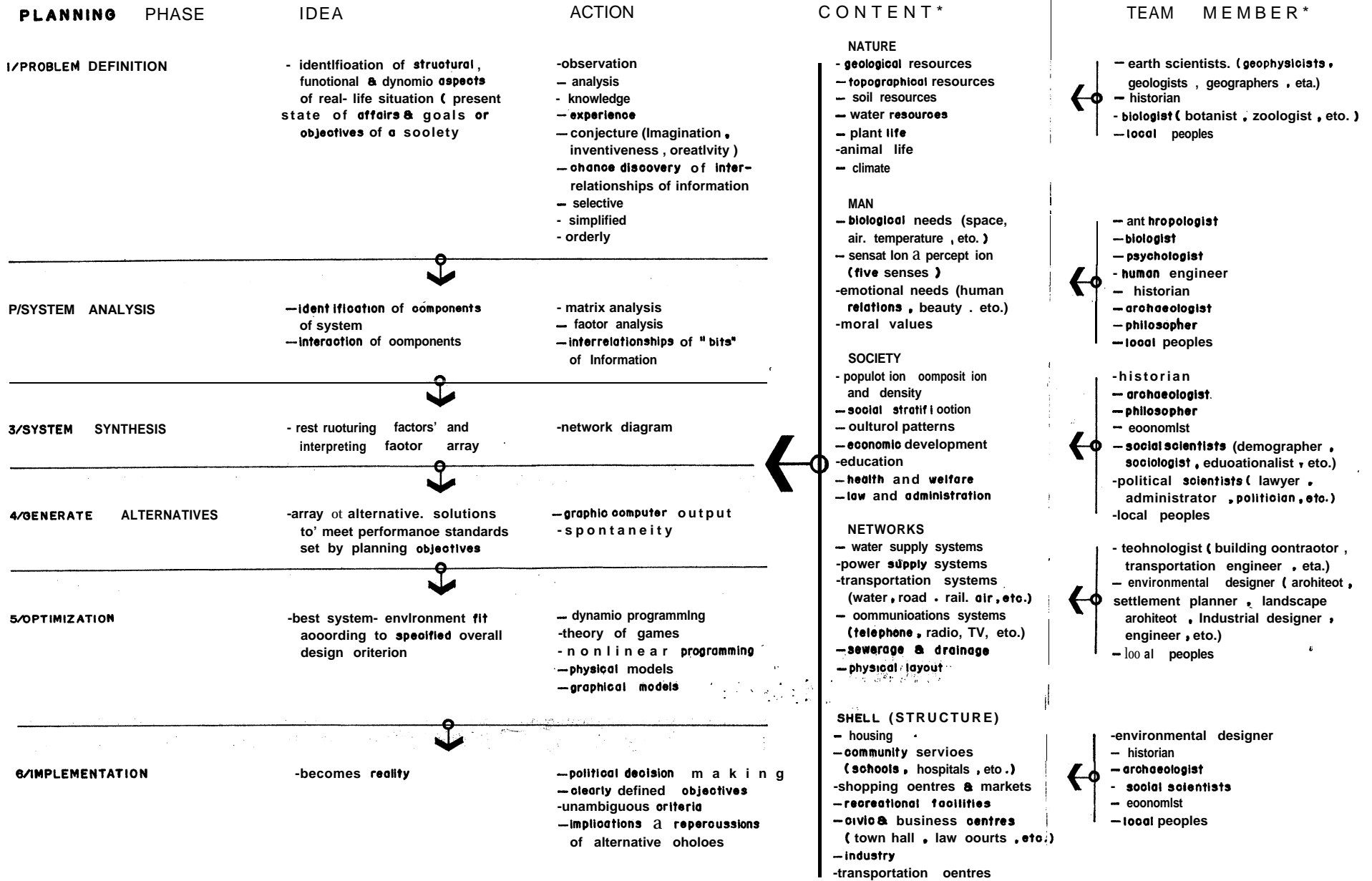


figure 4.d DIAGRAM OF TEAM ORGANIZATION

* basic list adapted from the "Ekistic Grid" (refer to the publication EKISTICS)

determined according to his qualifications to identify the specific needs and desires of a particular situation, to propose solutions which are derived from these needs and desires, or to regularly evaluate this situation in order to determine any changes through time. For example, a medical doctor might identify the health requirements involved in sewage disposal,, an engineer may determine the technical requirements, and a sociologist might determine the implications of each proposed solution as a "socializing" agent, Or, as another example, because of a particular background training and experience, a sociologist may contribute best to the content of the problem concerning the social stratification of an Eskimo society, may identify the components of this stratification which are relevant to the problem, and may determine the interaction of these components within the total system (Le. planning phase 2: System Analysis). However, this same sociologist may not be trained to generate an array of alternative solutions in order to meet the performance standards as set out by the planning objectives (i.e. planning phase 4: Generate Alternatives),. Another team member would then have to satisfy this planning phase 4.

A number of points, which are generally not recognized in a traditional planning approach, should be noted from diagram 4d:

- i) specific provision has been made for participation by the local peoples (i.e. the public) during the

planning process rather than as an assessment before it or after it.

ii) the co-ordination of a planning project depends on competent leadership capable of working within the general organizing framework of the planning process, and not entirely on the substantive knowledge that an individual professional "generalist" might contribute. Although such "leadership" may be entrusted to a "planner", it could as reasonably be placed in the hands of a lawyer, economist, local resident, or anthropologist. Administrative ability, leadership, political aptitude and the specific problem are important, the professional degree is not. In this team concept, the "planner" becomes a specialist alongside other experts in the organization; he does not assume an all-embracing role.

iii) throughout the planning process "consultants" are continually pursuing information-generating and Information-processing activities, and can at any time inject this information into the system in the form of "inputs".

Examples of the role of various team members are given in Chapters Five and Six.

4.4 Conclusion

Settlements may be viewed as systems entities comprising interacting, interdependent parts; they may be studied at a variety of levels: structural, functional, and dynamic; and they may be partitioned into a variety of sub-systems, In a systems framework, our concern is not with the apparent contradictions between the kinds of conclusions reached for different sub-systems, since the difference is understood to be one of the relative balance of entropy-approximating or order-generating processes in various parts of the system,

In contradistinction, however, we have very little understanding in systems theory of how to put these different patterns together in more general models that are comprehensive in scope, This is where the concept of planning as a continuous design process becomes particularly significant. As increased knowledge and new methodologies and techniques continually aid in the explanation and manipulation of complex settlement phenomena, we at the same time are beginning more and more to recognize the unprecedented complexity of natural phenomena. The concept of planning as a continuous design process is essentially a tool, a general framework for integrating this knowledge, the methodologies and the techniques, and for channeling the creative efforts of the planning team along the most productive lines.

In this section, the author also suggests why and how specialist activities can contribute most effectively to the planning process,, and what each team skill can contribute in order to result in an efficient and effective programme of interlocking studies, The planning process is proposed as a possible systematic, theoretical and organizational framework for the formulation and programmed execution of planning projects by a large number of "specialist" planners.

CHAPTER FIVE / THE METHODOLOGY OPERATIONALLY: AN EXAMPLE

Through the use of a specific example, the following chapter experimentally applies and evaluates the settlement planning theory and methodology proposed in Chapter Two and Four. The purpose of this example is to demonstrate this approach from a comprehensive point of view, with the emphasis on human needs, values, and interactions. During the synthesis stage no attempt is made to generate alternative land use plans to "fit" each grouping of needs and desires. Rather, these alternative solutions are physical, economic, or social in character, depending upon the criteria which they must satisfy. Following the planning process shown in figure 4a, page 41, the example is developed in the general stages of:

- 1) problem definition, including the particular objective of this example.
- 2) system analysis
 - i) components selected
 - ii) component interaction determined
 - iii) sub-systems determined
- 3) system syntheses
 - i) interpreting sub-systems
- 4) generating alternatives-:'
- 5) optimization (recommending alternatives)*

*These phases are exemplified in Section 6.1

5.1 Problem Definition: Inuvik As An Interaction Realm

The subject under consideration is the settlement of Inuvik, N.W.T.* Wright, following a theory and methodology similar to those developed in this study, has concurrently demonstrated the usefulness of such an approach in describing functionally the settlement of Inuvik. He first defines the significant component groups and relationships which represent, on a relatively gross scale, the "functional structure" of Inuvik, and from this model generates a number of alternative planning solutions (Wright, 1967).

In this study, a slightly different approach is taken. The purpose is again to demonstrate one possible way of identifying the structure of interrelationships for the selected components of a real-life situation. However, in this particular example the objective is to indicate the needs and desires of the Inuvik inhabitants in relation to their settlement's attributes, and to generate suggestions in the form of a structuring framework as to how these needs and desires might be met in a planning context. It can, therefore, be viewed as a "sub"-planning process, fitting into the SYSTEM SYNTHESIS and GENERATION OF ALTERNATIVES phases of the overall planning process. It is orientated not directly to the

*Refer to figure ii, page ii, for an existing land use map of the settlement of Inuvik. For studies regarding Inuvik and the Mackenzie Delta Region refer to (Lotz, 1962b), (Mailhot, 1966), (Cooper, 1966), (Smith, 1966), and (Wolforth, 1967).

external world which the planner hopes to control, but to the decision process of which he is a part.

5.2 System Analysis

The settlement of Inuvik is viewed as a functioning system, composed of an interrelated array of component parts, behaviourally "atomistic" in their relation to the whole settlement. Axiomatic to this view is the proposition that the more closely any conceptualization approximates the structure and functioning of a real-life situation, the more meaningful is this array to a planner.

The field of regional science offers a few simple, empirical generalizations whose validity has been established reasonably well, and which are particularly compatible with the concept of analyzing a system (Vining, 1955), (Isard, 1960). The following are particularly germane:

- 1) the structure of human settlements can be defined as a system of nodes and Functional linkages.
- 2) nodes are arranged into a loose hierarchical structure which is internally differentiated by function.
- 3) surrounding each node is a density field of functional interaction, the densities declining with increasing distance from the centre.

These generalizations strongly suggest that there is a certain regularity and order in the structure of space as it is shaped by human activities and aspirations,

5.2i Components Selected

If we want to understand a system such as a settlement, we must specify what its components or constituent parts are; in order to determine the components or constituent parts of the real-life situation under consideration, the analysis stage begins by first defining the rationale for the choice of these components, The selection of these constituent parts, and their interrelationships indicated in the sections following, are often the choice of a number of "specialist" team members and are not necessarily the choice of the author. It should be noted also that, within the framework of this methodology, the local Mackenzie Delta residents can effectively participate as team members.

In this particular example, the over-all objective is to structure the needs and desires of the Inuvik inhabitants regarding their local environment, with the purpose of aiding directly in making planning decisions, An attempt is made subjectively to maintain a consistent level of generality in the selection of components representing the same general "Class". For example, a "social group" class of components, such as "fire chief" and "permanent white couples" are not included in the same component groupings, since each represents a different level of relative importance to the over-all problem.

The example is viewed as representing an immediate, (i.e. *'short-term'), practical planning problem. The components

are therefore thought of as realizable "states", (in the sense of being feasible to transcribe into reality), rather than as purely mental "goals". In this way the approach is much closer to "real" solutions than to "abstract" ideals,

Components are chosen with the above general objectives in mind and on the basis of representing:

- 1) settlement attributes which fulfill the more immediate needs and desires of the Inuvik inhabitants.
- 2) inhabitants, as identified by the social groups who aspire to these attributes.

These criteria for choosing components may seem to pose arbitrary restraints on the problem,, In reality, however, they are restraints by choice, and in this way are no more arbitrary than the features of any other "model"; a simplified construct of reality, retaining only the features which reveal the essence of a particular situation and for a particular purpose (Hagen, 1962). Such a model helps the Planner to recognize what components are being taken into account , and what relationships among them are assumed, and hence to know the basis of his conclusions.

Since the choice of components is directly dependent upon these criteria, it is imperative that these "terms of reference" be explicitly stated. For example, on the basis of the criteria and the objectives as stated above, a component such as "the desire for a temperate outdoor winter temperature" could not be selected, since this component is outside the "practicality" scope of this particular problem,, Nevertheless,

with different objectives and criteria, this component could become a logical choice to include in such a list of components.,

Following is a list of the selected components. Most of the components are stated in standard settlement planning terms; common reference to these components can be found in (Chapin, 1963a), (Donnelly, Chapin, and Weiss, 1964) and (Gallion, and Eisner, 1963). Components which might be slightly ambiguous are explained in some detail. Many of the components have been suggested by some other member of the planning "team", and are therefore not necessarily the direct choice of the author. For the sake of expediency when later referring to component groupings, each component is related to one or more of seven general classes:

- A. Health and Safety
- B. Convenience (locational factor)
- C. Economic income and expenditures
- D. Physical settlement properties
- E. Social interaction
- F. General settlement trends, controls and change phenomena
- G. Social groups

FINAL LIST OF 95 COMPONENTS *

| <u>CLASS</u> | <u>COMPONENT</u> |
|--------------|--|
| A | 1. Protection against accidents and hazards: desirability of protection in relation to potential "risks" such as industrial accidents, etc. |
| A | 2. Protection against contagion: the medical, social and physical controls for the spread of communicable physical diseases, |
| A | 3. Provision for maintenance of cleanliness: "cleanliness" is here used in a cultural context, . respecting the differences of interpretation by "white southerners", "Mackenzie Delta Trappers", etc. |
| A | 4. Provision of adequate daylight, sunshine and ventilation: "adequate" is used in the sense of fulfilling both physical and mental requirements. |
| A | 5. Protection against excessive noise: "excessive" is assumed to mean physically or mentally harmful, |
| A | 6. Protection against atmospheric pollution and offensive odors: in the sense of pollution and offensive odors becoming a nuisance factor rather than a health consideration. |
| A | a. Provision from fatigue: *'fatigue" meaning the combined physical-mental strain resulting from a particular occupational activity. |
| A | 8. Provision of adequate privacy: "adequate" is used in the sense of working towards a "normal" social and personal development in relation to a certain activity, For example, a student requires a certain degree of privacy for the activity of "studying". |
| A | 9. Provision of opportunities for normal family and community life; again "normal" is used in a cultural context, |

*Other components were at first included in this list, but were gradually eliminated because they appeared to be either of a different level of generality or extraneous to this particular example;

- A 10. Protection **against** moral hazards: on the basis of each culturally acceptable definition of morality.
- A 11. Provision of possibilities for reasonable aesthetic satisfaction: "aesthetic" is used in a visual sense.
- B 12. Nearness to land vehicular systems.
- B 13. Nearness to water vehicular systems.
- B 14. Nearness of home to work.
- B 15. Nearness of work to recreation.
- B 16. Nearness of home to recreation.
- B 17. Nearness of home to shopping.
- B 18. Nearness of home to health facilities.
- B 19. Nearness of storage (warehouses) to office and retail areas.
- B 20. Nearness of retail to industrial areas.
- B 21. Nearness of home to religious facilities.
- B 22. Nearness of home to social facilities,
- B 23. Nearness of home to school facilities.
- A 24. Availability of sewerage.
- F 25. Availability of zoning protection.
- E 26. Proximity to same ethnic area.
- A,F 27. Proximity to blighted areas (poverty, disease).
- A ,F 28. Separation from blighted areas (poverty, disease).
- E,F 29. Proximity to mixed land uses: in the sense of combined -industrial-residential-storage uses, commercial-residential uses, etc.
- A 30. Provision of general residential amenities (upkeep, services): on the basis of amenities generally assumed to be necessary for any Canadian settlement of a similar size.

- C 31. Maximum economic income from the land: in the sense of land itself providing interest or dividends,
- C 32. High assessed land value,
- C 33. Strong competitive "pull" of the area.
- C 34. Prospective investment in public improvements.
- C 35. Minimum local property taxes,
- C 36. Minimum operating costs.
- C 37. Maximum interest on capital invested.
- C 38. Maximum product sales potential at a particular site.
- C 39. Minimum commuting expenses within the settlement of Inuvik.
- C 40. Minimum improvement costs to land or buildings.
- C 41. Large supply of competitive settlement land,
- F 42. High intensity of land development,
- D 43. Good drainage characteristics of soil.
- E 44. Land not subject to flooding.
- F 45. Low turnover of occupancy.
- F 46. Increasing intensity of adjacent land use.
- F 47. Decreasing intensity of adjacent land use,
- D 48. Unpolluted ground water supply.
- D 49. Protective orientation with respect to prevailing winds.
- F 50. Utilization of natural pleasing features of the landscape: in the sense of being sympathetic to the topography.
- C 51. Ease of marketability of land titles.
- C 52. Minimum anticipated risk in investments,.
- C 53. Minimum interest on borrowed money.
- C 54. Maximum interest on loaned money.

- B,E 55. Convenient to streams of pedestrian traffic,
- F 56. Maximum knowledge of change of patterns of value through time.
- F 57. Maximum knowledge of use pattern change through time.
- F 58. Maximum knowledge of "whims" of land owners,
- F 59. Maximum knowledge of "whims" of land occupant%
- F 60. Minimum speculative subdivision of land.
- D 61. Minimum land vehicular traffic congestion.
- F 62. Diversification in industry.
- E 63. Variety and opportunity for choice in way of life,
- E 64. Freedom from ethnic conflict.
- F 65. Allowing "fringe" developments to occur.
- G 66. Children 0-16 of local families: including Indian, Eskimo, white, Metis, and others.
- G 67. Children 0-16 of non-local families: including Indian, Eskimo, white, Metis, and others.
- G 68. Native girls 16-21: "native" in this and the following components is used in its generally accepted sense as referring to peoples with Indian, Eskimo, or Metis backgrounds,
- G 69. Native boys 16-21.
- G 70. White girls 16-21.
- G 71. White boys 16-21.
- G 72. Unmarried native women (over 21).
- G 73. Unmarried native men (over 21).
- G 74. Unmarried permanent white women.
- G 75. Unmarried permanent white men.

76. Unmarried transient white women; "transient" in this and following components refers to people who reside in the settlement of Inuvik for relatively short periods, and who have no intention of making the settlement a permanent home. As examples, most Federal Government employees and teachers are considered to be "transients".
- G 77. Unmarried transient white men.
- G 78. Local married native couples.
- G 79. Non-local married native couples.
- G 80. Married permanent white couples.
- G 81. Married transient white couples.
- G 82. Trades labor.
- G 83. Skilled labor.
- G 84. Unskilled labor.
- G 85. Managerial and professional employment: includes teachers, the Regional Administrator, the Fire Chief, and other persons with a formal professional training and/or a senior official position.
- G 86. Self-employed as owner-manager.
- G 87. Self-employed as harvester of natural resources,
- G 88. Unemployment,
- G 89. Gainful employment in the home: includes employees of the Fur Garment Industry, people producing handicrafts at home in order to supplement their income, etc.
- G 90. "Employment" as vocational stud&t.
- G 91. Membership in educational clubs/associations: includes Home and School Associations, Pre-School Association, Womens' Study Group, Stefansson Science Club, Womens' Institute, Mothers' Group, etc.

92. Membership in community and service clubs/associations: includes Inuvik Community Association, Playground Committee, Voluntary Fire Brigade, Lions' Club, etc.
- G 93. Membership in occupational clubs/associations: includes Inuit Housing Co-op., Chamber of Commerce, Civil Service Association, Teachers' Association, Trappers' Association, Students' Union, etc,
94. Membership in religious groups: includes Roman Catholic Church, Anglican Church, Pentecostal Church, Church of the Latter Day Saints, etc.
- G 95. Membership in recreational clubs/associations: includes Inuvik Curling Club, SAMS' Curling Club, Fastball League, Basketball Club, Badminton Club, Boxing Club, Weight-Lifting Club, Ski Club, Ing-a-mo Association, Chess Club, Drama Club, Teen Town, Scouts and Cubs, Guides and Brownies, etc,

Throughout the problem, an attempt is made to maintain the definition of each component, . Whenever this becomes infeasible or undesirable and the meaning changes, all previous work is reviewed and changed accordingly. Such an explicit definition for each component acts as a constant check for the planner, and becomes especially important to a team approach; Through such explicit statements problems can be relatively easily approached, with the hope of gaining a general consensus.

The list of 95 components represents one view of the overt settlement attributes which the Inuvik inhabitants may desire, and the social groups as related to these attributes. In this way, the list forms an over-all ordering of the particular situation. Each of the component classes A-G also forms an ordering of a portion of this situation. Therefore, in an attempt to determine the relationship of the "sub-orderings"

to the over-all ordering of the problem, the list of 95 components is approached and compared from five different viewpoints. The components for each approach are listed in Sections A of Appendices One, Two, Three, Four and Five, and are referred to respectively as EXAMPLES 1, 2, 3,4 and 5. (These "sub-groupings" will be clarified further in the following sections.)

5.2ii Component Interaction Determined

To determine the interrelationship between each pair of components, an interaction matrix is used. (The theory for such a matrix is covered in the preceding section 4.2iii.) This matrix identifies the dominant relationships among the components and presents these relationships within a logical framework.

In the EXAMPLES 1-5 inclusive, interaction indicates the degree of "fit" or compatibility between each component to every other component.* A three-point scale rating is used, (the choice of this particular scale rating is entirely experimental), to indicate compatibility of interaction, following the general rules that:

- 1) components which are congruous,, in the sense of working well together, are given an interaction rating of "+1".

*This particular use of the matrix is adapted from (Alexander, 1964a).

2) Components with no or negligible interaction are rated as "0".

3) Components with incompatible or incongruous interaction are rated as "-1".

Following are representative examples of the procedure followed in determining component interaction:

i) Components 13 (Nearness to water vehicular systems) and 87 (Self-employed as harvester of natural resources) are rated with an interaction of "+1". The decision for this-rating is based on the field observation that people living from the land are very dependent on water travel during the summer season;

ii) The interaction of components 13 (Nearness to water vehicular systems) and 76 (Unmarried transient white women) is rated at "0", since the dependency of unmarried transient white women on water travel is relatively negligible.

iii) The interaction of components 12 (Nearness to land vehicular systems) and 1 (Protection against accidents and hazards) is rated as "-1". These settlement attributes are mutually incompatible.

iv) On the basis of a discussion with an elderly Eskimo Woman, who is therefore considered a "team" member, from the "west" end of Inuvik, the interaction of components 18 (Nearness of home to health facilities) and 78 (Local married native couples) is rated as "+1". Component 18 represents a desirable settlement attribute

to this particular group of people,

When determining component interaction, an attempt is made to establish a relative hierarchy of importance in the selection. For example, although "safety" is a basic human desire, it is considered to be more important by certain social groups than by others, and would therefore be differentiated with interactions of "+1" and "0" for the respective social groups. In this way only relatively discrete groupings of components are determined. However, if the interaction of a number of components represent an equal degree of compatibility, (in the sense of being unable to establish a meaningful hierarchy of importance), the interaction is designated as being equally compatible (i.e. all are rated at "+1", "0", or "-1").

This is only one of the many possible scale ratings which could be used. For an example using a different scale rating see (Wright, 1967). Additional research is required to determine the effect of other ratings.

The total interaction pattern, (in the sense of the interaction of one component to every other component) of certain components yielded either direct "opposites" and/or indicated no interaction in the matrix. That is, when the interaction of any component "a" was "0", the interaction of any component "b" was "0", -when the interaction of component "a" was "+1", the interaction of component "b" was "-1"; and when the interaction of component "a" was "-1", the interaction of component

"b" was "+1", These components, being only opposites of the same component, yield an interaction pattern of a double importance to the over-all matrix pattern. The rule was therefore formulated that only one out of two "opposite" components is included in a matrix,

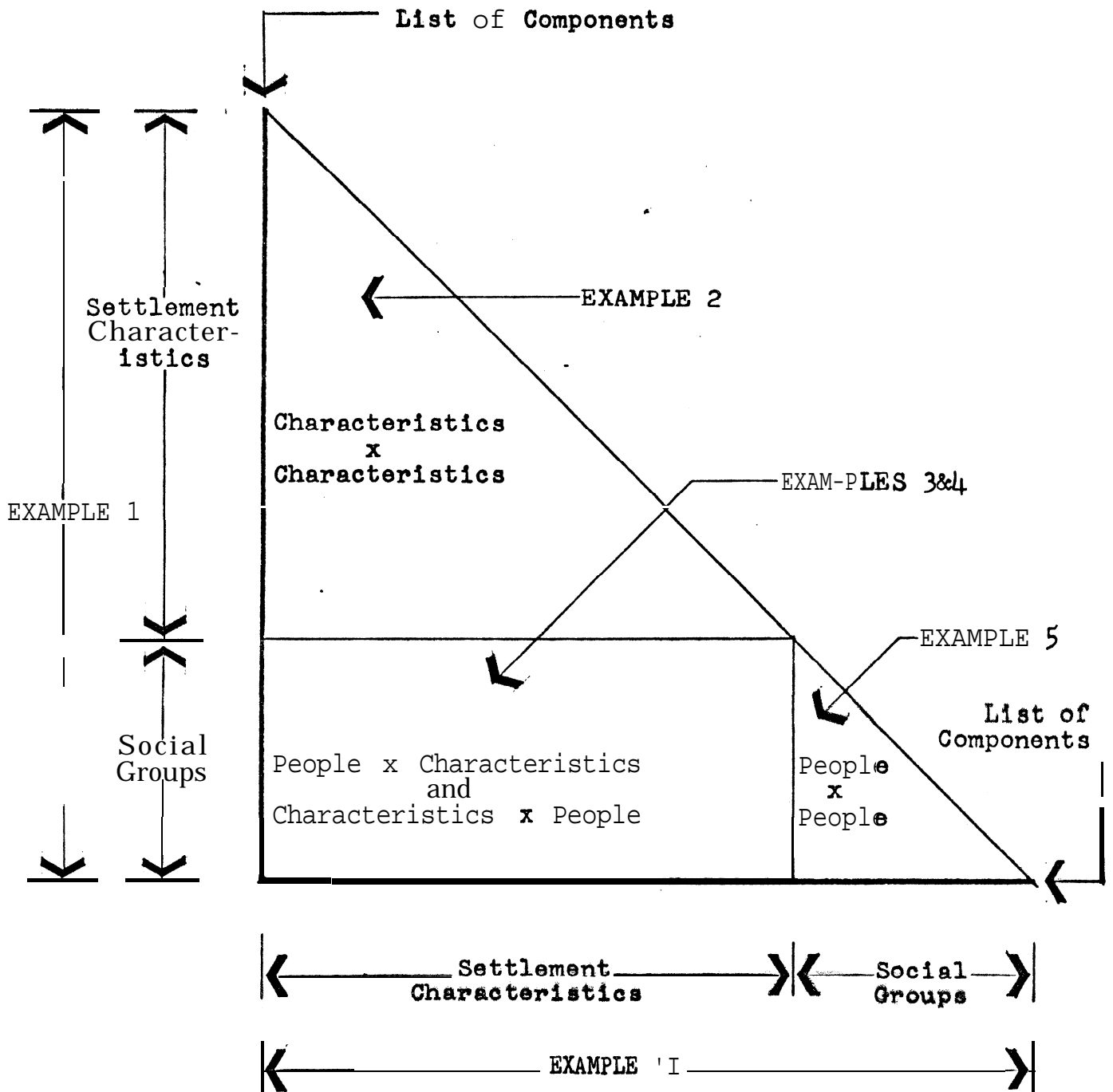
It should be noted, however, that although certain components might on observation appear to be "opposites", their interaction patterns may disprove this. For example,, the interaction patterns of the potentially "opposite" components "Proximity to blighted areas" and "Separation from blighted areas" are significantly different@ It is therefore suggested that "opposite" components be determined from the interaction patterns, rather than directly from observation of the components themselves,

The figure on the following page indicates the complete matrix interaction pattern produced by the list of 95 components, Figure 5b, shows schematically the relationship to this over-all matrix of the components in each of the EXAMPLES 1, 2, 3, 4 and 5.*

*EXAMPLE 2 includes components 43, 44, and 45 which are not included in any of the other examples and which are not shown in figure 5b. This is explained in the section following,

figure 5b

RELATIONSHIP OF EACH EXAMPLE TO OVER-ALL MATRIX



5.2iii Sub-Systems Determined

Each matrix of the ordered components is now factor analyzed, The technique of factor analysis allows the problem-solver to group the problem into sub-problems of a manageable size, and on the basis of intensity of interaction of the components. The actual nature of this technique is in detail highly abstract and -mathematical. In concept, however, this technique provides a way in which the appearance of a number of inter-related components in a settlement can be reduced to a more limited number of essentially independent "factors". In demographic analysis, for example, it has been found that a large proportion of the differences between neighborhoods in a city may be explained on the basis of only three independent or nearly independent factors which are related to status, density and family size,, and segregation. In terms of data storage and retrieval, factor analysis provides a powerful means for organizing large masses of data and identifying underlying patterns of interrelations among variables.

From the table of "eigenvalues", (part of the factor analysis technique explained in Section 4.2iii), the significant factor breakdowns or sub-problem levels can be determined. A "Graph of Eigenvalues" indicating these levels for each EXAMPLE 1-5 is shown in Section B, Appendices One, Two, Three, Four and Five. In Section C of the Appendices One to Five inclusive are the component lists for the factors of each of the

significant sub-problems, as determined from the eigenvalue graphs.

Within each factor, each component is mathematically weighted and rank ordered as part of **the** "varimax rotation" of the computer program (Harmon, 1962). These weights or "loadings" are indicated in a descending order for each factor, and represent generally the relative importance of each component to the factor. A cut-off point is established at the lowest point considered to represent a meaningful contribution of a component, and at the same time represents relatively discrete factors,. In this particular example, the cut-off point is established at .4. If the cut-off point is chosen at .2, for instance, many components tend to be included in more than one factor grouping. The over-all ordering of the problem then becomes quite ambiguous.

The computer output displays the factor loadings in four figures. However, in order not to suggest a false sense of accuracy in this example, these factor loadings are rounded off to one figure.

The first matrix completed was the list of components in EXAMPLE 2, Appendix Two,, After running the factor analysis of this matrix, it was noted that the interactions of components 43 (Terrain slope 0 degrees), 44 (Terrain slope of 0-15 degrees!), and 45 (Terrain slope of 15+ degrees) was relatively insignificant to the over-all ordering pattern of the problem. That is, according to the component "loadings", each of the components

43, 44, and 45 did not contribute towards creating discrete, meaningful factors. A rule was therefore formulated **that** wherever the interaction of components does not contribute to the over-all "ordering pattern" of the problem, such extraneous components are eliminated from the matrices. This also has the advantage of limiting the size of the matrix to only the "significant" components, thereby making the analysis and synthesis of the problem easier for the problem-solver. For these reasons, the components 43, 44 and 45 are not included in any of the EXAMPLES 1,3,4 and 5.

Each factor can be designated by an appropriate title, according to its constituent component relationship to the real-life situation. As examples, refer to the following two factors from EXAMPLE 5, Appendix Five:

SUB-PROBLEM LEVEL TWO - (Two Factor Solution)

Factor One (F1) -

1. Children 0-16 of local families,,
2. Children 0-16 of non-local. families.
3. Native girls 16-21.
4. Native boys 16-21.
8. Unmarried native men (over 21).
14. Non-local married native couples,
7. Unmarried native women (over 21).
13. Local married native couples.
19. Unskilled labor,,
23. Unemployment.

Factor Two (F2) -

6. White boys 16-21.
5. White girls 16-21
9. Unmarried permanent white women,
11. Unmarried transient white women,
16. Married transient white couples,
17. Trades labor,,
18. Skilled labor
30. Membership in recreational clubs/associations.

Factor One (F1) includes all native and white children; Indian, Eskimo, and Metis youths and adults; and activities related to these social groups. It can therefore be called the "Children and Native" factor,

Factor Two (F2) includes white youths and adults and activities related to these particular social groups, The factor can be called a "White Youth and Adult" factor. A similar procedure was followed in naming each factor for EXAMPLES 1-5 inclusive. This name appears with each list of components, for every factor in the Appendices.

Designating factors by titles has two major advantages:

- 1) the planner is required to conceptually relate each factor to the real-life situation, providing a simplified ordering of the problem for the planner, and aiding the planner in relating the over-all problem to the real-life situation.
- 2) expediency when referring to groups of components.

For each matrix, the factor analysis begins with the most general problem, and ends with the most specific problem. This is exemplified by the following factors from EXAMPLE 1, Appendix One:

-most general problem

SUB-PROBLEM LEVEL TWO - (Two Factor Solution)

Factor One (F1) - Money, Trade and Efficiency

33. Strong competitive "pull" of the area,
31. Maximum economic income from the land.
37. Maximum interest on capital invested in present and future improvements,

51. Ease of marketability of land titles.
52. Minimum anticipated risk in investments.
58. Maximum knowledge of "whims" of land owners.
85. Managerial and professional employment.
86. Self-employed as owner/manager.
32. High assessed land value.
34. Prospective investment in public improvements.
36. Minimum operating costs.
38. Maximum product sales potential at particular site.
40. Minimum improvement costs.
46. Increasing intensity of adjacent land use.
56. Maximum knowledge of change of patterns of value through time.
59. Maximum knowledge of "whims" of land occupants.
19. Nearness of storage (warehouses) to office and retail areas.
42. High intensity of land development.
43. Good drainage characteristics of soil.
44. Land not subject to flooding.
45. Low turnover of occupancy.
49. Protective orientation with respect to prevailing winds.
50. Utilization of natural pleasing features of landscape.
53. Minimum interest on borrowed money.
57. Maximum knowledge of use pattern change through time.
61. Minimum land vehicular traffic congestion.
93. Membership in occupational clubs/associations.
20. Nearness of retail to industrial areas.
24. Availability of sewerage.
30. Provision of general residential amenities (upkeep, services).
39. Minimum commuting expenses.

-most specific problem

SUB-PROBLEM LEVEL TWENTY -- (Twenty Factor Solution)

Factor Seventeen (F17) -- Knowledge of Present and Future Patterns

56. Maximum knowledge of change of patterns of value through time.
57. Maximum knowledge of use pattern change through time.
59. Maximum knowledge of "whims" of land occupants.
58. Maximum knowledge of "whims" of land owners.

These examples represent two sub-problems with "extreme" levels of importance in relation to the over-all problem.

The "lower" level of importance, (i.e. the most specific problem), includes four components from the thirty-one components in the "upper" level of importance (i.e. the most general problem).

The sub-problem breakdown is automatically terminated according to certain mathematical conditions in the computer program. To the planner, this termination can essentially be considered as the point where further breakdown becomes irrelevant in terms of the sub-grouping for the particular problem being considered, In other words, at this point, additional sub-groups are of no significance to the problem, Following is a list of the EXAMPLES 1-5 and their respective factor breakdown termination points:

| <u>EXAMPLE</u> | <u>TERMINATION POINT</u> (Sub-Problem Level Number) |
|--------------------|--|
| 1. (95 components) | 20 |
| 2. (68 components) | 14 |
| 3. (30 components) | 10 |
| 4. (65 components) | 10 |
| 5. (30 components) | 9 |

The factor groupings for each of the EXAMPLES 1-5 are included under Sections D of the Appendices One to Five inclusive. A dashed line links the "problem definition" to the factors in the following sub-problem level, A dotted line indicates a "weak" link between two factors. That is, the "commonness" between two factors is based on components with factor loadings approximating .4. "Nodes" are coded as F1, F2, F3, etc., according to the respective factor which each node represents in Sections C, Appendices One to Five inclusive.

The factor groupings for each matrix create both lattice, (i.e. crossed or interlaced), and tree patterns (i.e. patterns descending in a hierarchical order),*

In evaluating these patterns, two general observations were made and rules formulated from these observations:

1) factors with a large number of relationships (i.e. links) to other factors are represented on the network by a point which has a large number of connections to other points. If the points in a network are ranked in a hierarchy according to their "connectedness", their position in the hierarchy indicates some measure of their cruciality in the system. In terms of problem-solving, to the planner these nodal points suggest areas of overlap, component sensitivity,, and complex interrelationships in the over-all structuring of the problem.

2) in the network certain factors remain linked through a number of sub-problem levels, and are relatively independent of the remaining factors. When choosing a starting place and a subsequent path through the network, which establishes a sequence of problem-solving

"Following a similar procedure for a similar problem, Alexander indicated that a tree pattern is created (Alexander, 1964a). He later re-evaluated these findings, concluding that a tree diagram as a conceptual device is inaccurate for solving problems related to human settlements, Alexander then proposed that a semi-lattice structure is more appropriate, since such a pattern acknowledges overlap in settlement interaction patterns (Alexander, 1965). The semi-lattice patterns resulting from the factor groupings in the present study correlate with Alexander 's later findings.

"states", a planner is deciding on a procedure for solving the network. There are a number of procedures that he may use for doing this; however, the approach which offers the least "lines of resistance" is that of splitting the network into the most discrete sub-networks, and solving these sub-networks independently as far as possible. Therefore, the sequence in which the planner tackles the discrete sub-networks. which may be viewed as his path through the over-all network, is chosen to make the matching of sub-solutions as easy as possible. (It is shown in the following sections that the sub-solutions themselves can be chosen similarly,

The validity of these rules can be checked by logically following the factors through a number of patterns in Sections D of Appendices One to Five inclusive.

5.3 System Synthesis

The preceding sections of this Chapter dealt with the analysis or "breakdown" steps of the proposed methodology, and present to the planner a certain ordering of a "half-solved" problem (Dewey, 1938). The planner is now faced with the synthesis or "build-up" steps in solving the problem: the steps of combining parts or components to form a whole, by applying the previously obtained results with the creative endeavor of the planner.

For a number of reasons, interpreting the results of the synthesizing process is one of the most difficult yet creative parts of the total methodology:

- 1) although personal biases which enter into the planning process can be somewhat decreased by following certain procedures, it is unlikely that these biases will ever be completely eliminated: settlement planning, as well as any other design endeavor, centres around the heterogeneity of human nature, It should be noted, however, that the methodology proposed has the advantage of including and dealing with most biases at the analysis stages in the problem-solving process (i.e. at the least critical and most simplified stages). Biases included at the synthesis or solution stages are complex to recognize, and even more complex to deal with."
- 2) the component selection and interaction criteria may be both incomplete and misleading. It is a basic

*Although the technique requires further study, one particular approach comes to mind which seems to offer the potential of further decreasing the possibilities of including personal biases in the problem-solving process. The general procedure is this: once a common matrix and common criteria for determining interaction is developed, (either by the planner individually or by the interdisciplinary group), this matrix is then completed by a cross-section of persons representative of all social groups. A factor analysis is then run for each matrix, and the factor breakdowns and ordering patterns are determined. Each ordering pattern is then correlated with every other ordering pattern. The differences or disagreements in the groupings indicate potential "misfits" in the planning problem, Vice-versa, the greater the degree of correlation in the groupings, the greater the mutual agreement or "fit".

human trait to emphasize the known, tangible aspects and to relegate to a lesser position, (or to negate), the more intangible aspects, This trait is closely associated to the state of knowledge at a particular time, since the scope of apprehension of the mind is continually changing with increased knowledge, 3) attitudes, aspirations, needs and desires are continually changing through time. If the feedback process is insensitive, these changes may not be recognized.

With these points in mind, we can now examine the sub-problem and factor arrays. The planning objectives define the limits or constraints in interpreting and using these sub-problems or factor arrays. For example, the objective might be to investigate the interrelationship of each component in the over-all pattern in order to describe or explain the situation; or, with different objectives, the sub-problem and factor arrays: can be used as a direct aid to the planner in the decision-making process (as in this particular example).

5.3i Interpreting Sub-Systems

We are now at the stage in the methodology where we can answer the questions: how can a planner apply, in a settlement planning context, the "ordered" patterns of the real situation? How do these patterns influence a solution? Throughout this section the primary emphasis is on the present real-life

situation, and how planners can most easily satisfy the needs and desires of the local inhabitants when proposing alternative solutions, alternative solutions which indicate either:

- a) an attempt to meet the needs and desires of the Inuvik inhabitants as structured by the component and factor groupings, or
- b) a conscious rejection of these structural patterns and the corresponding implications of this action.

This particular use of the methodology, then, does not directly yield alternative solutions, (as in Wright, 1967), but rather provides a structure or framework within which one can make planning decisions or recommendations, based on specific needs and desires.

The component and factor groupings can be approached in two different yet related, ways, depending upon the level of synthesis which the planning problem is entered (see **Section 4.2iii**). These two approaches and their characteristics are as follows:

- 1) Comprehensive Approach - (the problem is entered at a "high" level of synthesis; determining alternative patterns requires little re-synthesis, A high level of abstraction is followed throughout the problem.)
Step i) The over-all ordering pattern is studied by first determining the nodal points (i.e. a convergence or divergence of two or more factors at one factor, creating a branched linkage pattern), To the planner

these nodes or points of overlap indicate significant relationships of components in the over-all pattern; the components at these points represent the most significant groupings of needs and desires as expressed by the Inuvik inhabitants.

Step ii) The sub-networks are determined by linking transferred factors to themselves, and to their respective nodes, if such a node exists. New factors often form independent sub-networks without nodes, Step iii) From the linkages of the nodes and sub-networks, the alternative patterns are determined, When proposing alternative solutions, the planner can either meet this particular structuring of the needs and desires, or these needs and desires can be consciously negated. The planner, however, is able to recognize the implications of this action.

2) Build-up Approach - (the problem is entered at a "low" level of synthesis, requiring a great deal of re-synthesis in order to generate alternative solutions. Much of the re-synthesis is done with concrete "solutions" rather than with abstractions),

Step i) Each factor of the lowest-order sub-problem level is studied according to its constituent components and to the relationship of the factor to the over-all ordering pattern,

Step ii) The implications of each factor are transcribed into operational settlement planning terms.

Step iii) A similar procedure Es followed for each higher consecutive sub-problem level, following the hierarchy of factor "links" until the "total problem" level is reached.

Step iv) Alternative solutions are presented, or the needs and desires which the factors represent are consciously reassigned, (See the figure on the following page for an example of this sequence.)

The build-up procedure has already been adequately exemplified (Wright, 1967), and is therefore not explained further in this study. The remainder of this report, however, explains the comprehensive approach in greater detail.

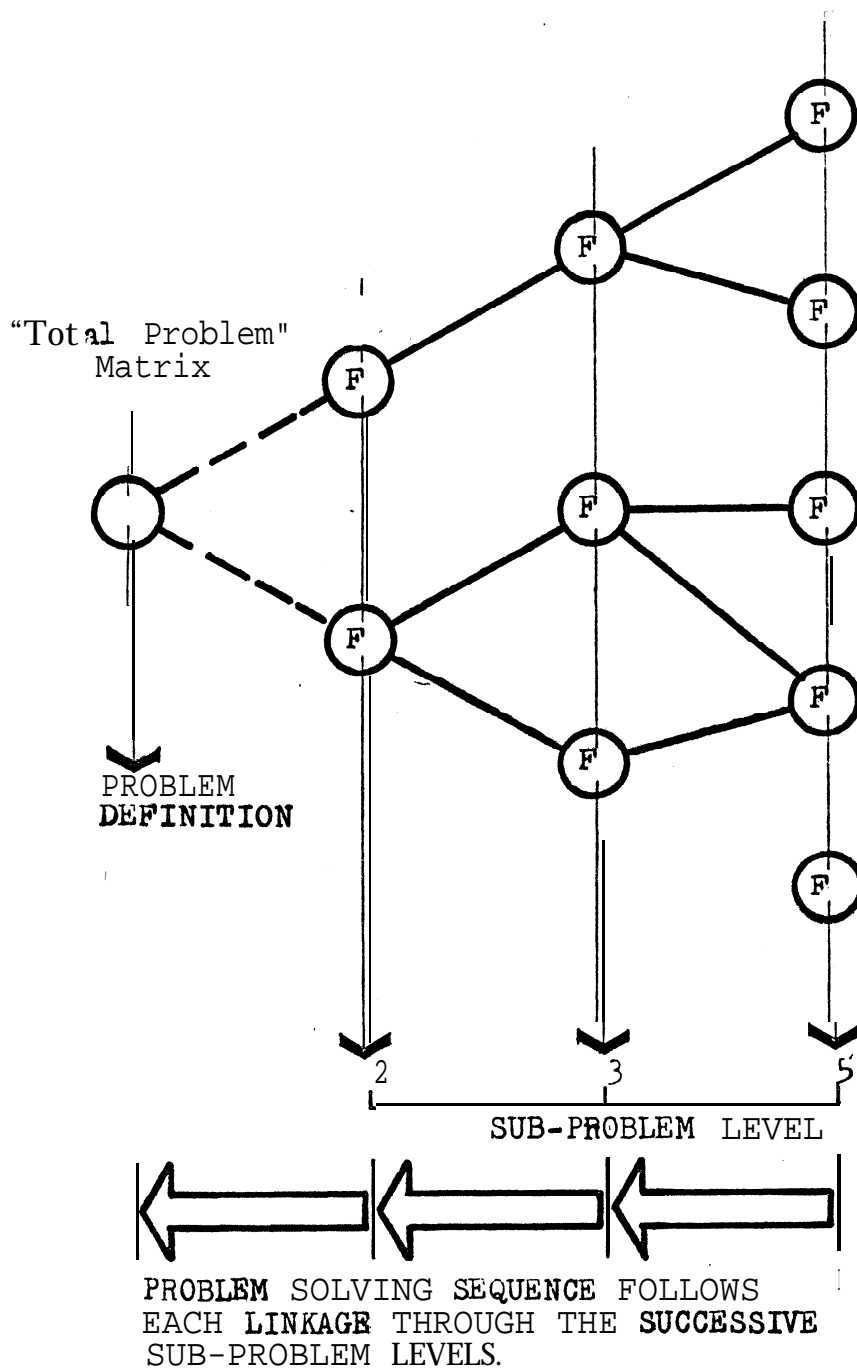
COMPREHENSIVE APPROACH

In order to clarify the over-all ordering pattern, each node and sub-network can be indicated on a diagram. By naming and numbering each node and sub-network, the following general patterns emerge for each of the examples:

EXAMPLE 1 (refer to figure 5d)

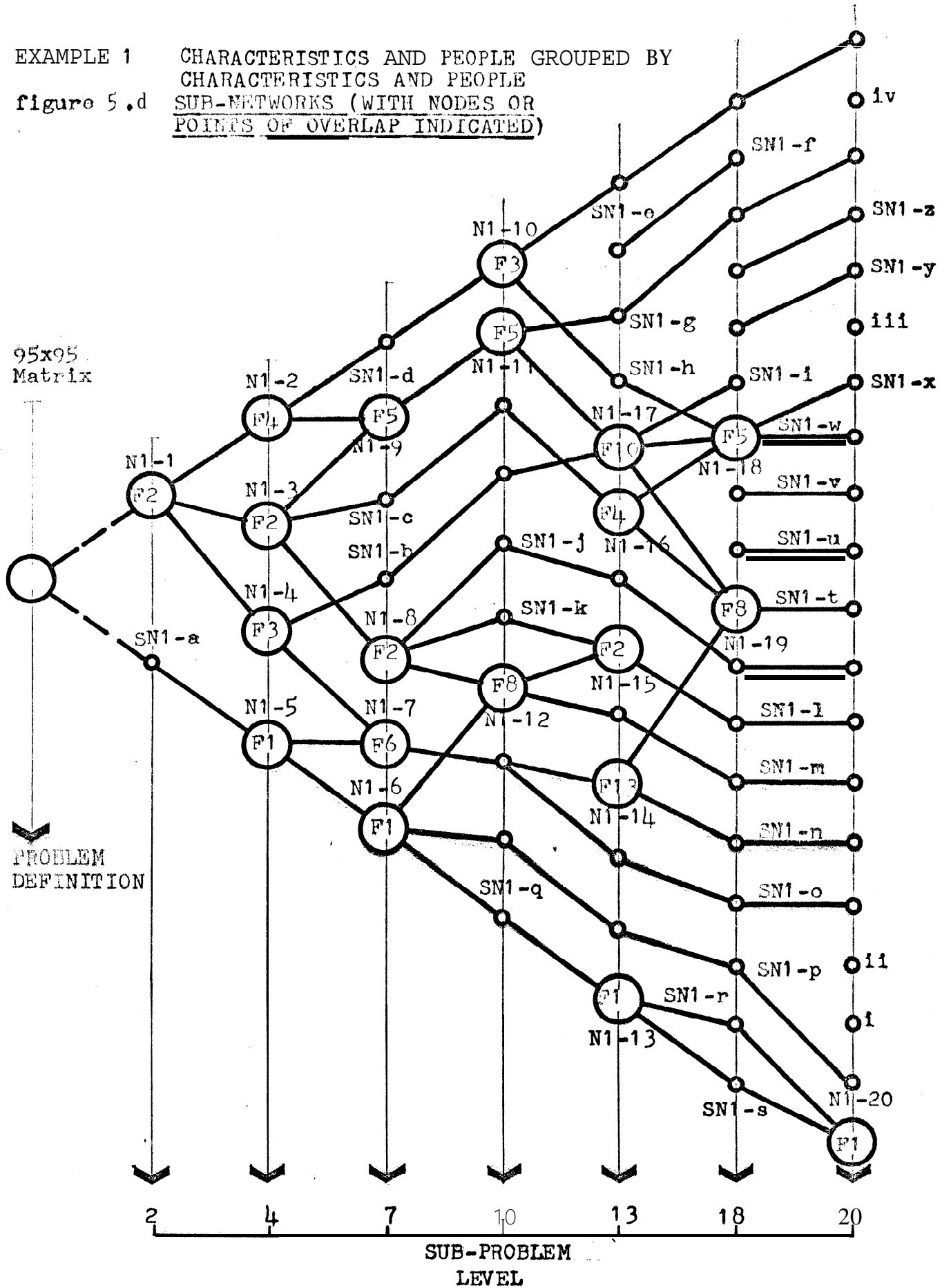
MODES

- N1 - 1 Convenience, Health, Safety, Youths and Children,
- N1 - 2 Health and Safety, . White Adults.
- N1 - 3 Convenience, Children, Youths and Unmarried Natives.
- N1 - 4. Protection and Labor.
- N1 - 5 Money, Trade and Efficiency,
- N1 - 6 Money, Trade and Efficiency.
- N1 - 7 Land Characteristics.
- N1 - 8 Convenience,
- N1 - 9 Health, Children, White Youths, and Unmarried Whites.
- N1 - 10 Health and Safety, White Adults:

figure 5.c BUILD-UP APPROACH

EXAMPLE 1
figure 5.d

CHARACTERISTICS AND PEOPLE GROUPED BY
CHARACTERISTICS AND PEOPLE
SUB-NETWORKS (WITH NODES OR
POINTS OF OVERLAP INDICATED)



- N1 - 11 Children., White and Native Youths, and Unmarried..
- N1 - 12 Convenience.
- N1 - 13 Money, Trade, Efficiency.
- N1 - 14 Separated From Blighted Areas.
- N1 - 15 Convenience.
- N1 - 16 "Unsettled" Native Peoples,
- N1 - 17 Labor and Youths.
- N1 - 18 Native Youths, Unmarried Couples.
- N1 - 19 Labor.
- N1 - 20 Money, Trade and Efficiency.

Sub-Networks

- SN1 - a Money, Trade and Efficiency.
- SN1 - b Labor and Privacy.
- SN1 - c "Unsettled" Native Peoples.
- SN1 - d Health and Safety, White Adults.
- SN1 - e Health and Safety.
- SN1 - f Total Community Spirit.
- SN1 - g Children.
- SN1 - h Permanent Married Couples.
- SN1 - i Youths.
- SN1 - j Intensity of Activities.
- SN1 - k Convenience.
- SN1 - l Convenience.
- SN1 - m Retail and Industrial Conveniences.
- SN1 - n Separated From Blighted Areas,
- SN1 - o Land Characteristics.
- SN1 - p Knowledge of Present and Future Patterns.
- SN1 - q Money, Trade and Efficiency.
- SN1 - r Owner, Manager, Professional,
- SN1 - s Money, Trade and Efficiency,
- SN1 - t Labor.
- SN1 - u Travelling Expenses,
- SN1 - v Vocational Student.
- SN1 - w Native Youths, Unmarried, and Couples,
- SN1 - x Land-Orientated Peoples,,
- SN1 - y White Adults.
- SN1 - z Unmarried Transient White Men.

Sub-problem level 20 in EXAMPLE 1 also yielded the following new factors:

- i) Ethnic Interaction,
- ii) No Fatigue.
- iii) Local Couples Way Of Life,
- iv) Community Spirit.

EXAMPLE 2 (refer to figure 5e)

NODES

- N2 - 1 Money, Trade and Efficiency,
- N2 - 2 Health and Safety,
- N2 - 3 Convenience.
- N2 - 4 Knowledge of Present and Future Patterns and Safety.
- N2 - 5 Convenience.
- N2 - 6 Health and Safety,
- N2 - 7 Convenience,
- N2 - 8 Knowledge of Present and Future Patterns.
- N2 - 9 Community Stability,
- N2 - 10 Land Characteristics.
- N2 - 11 Safety and Patterns.

Sub-networks

- SN2 - a Money, Trade and Efficiency.
- SN2 - b Convenience.
- SN2 - c Health and Safety.
- SN2 - d Safety and Patterns.
- SN2 - e Retail and Industrial Convenience.
- SN2 - f Safety and Patterns.
- SN2 - g Community Stability.
- SN2 - h Knowledge of Present and Future Patterns and Safety,
- SN2 - i General Amenities.
- SN2 - j Land Characteristics.
- SN2 - k Money, Trade and Efficiency.
- SN2 - l Slope of Land.
- SN2 - m Land Characteristics.
- SN2 - n Convenience.
- SN2 - o Community Stability,,
- SN2 - p Knowledge of Present and Future Patterns.
- SN2 - q Stability.
- SN2 - r **Safety** and Patterns.
- SN2 - s Convenience.
- SN2 - t Health and Safety.
- SN2 - u Proximity to Blighted Areas.

EXAMPLE 3 (refer to figure 5f)

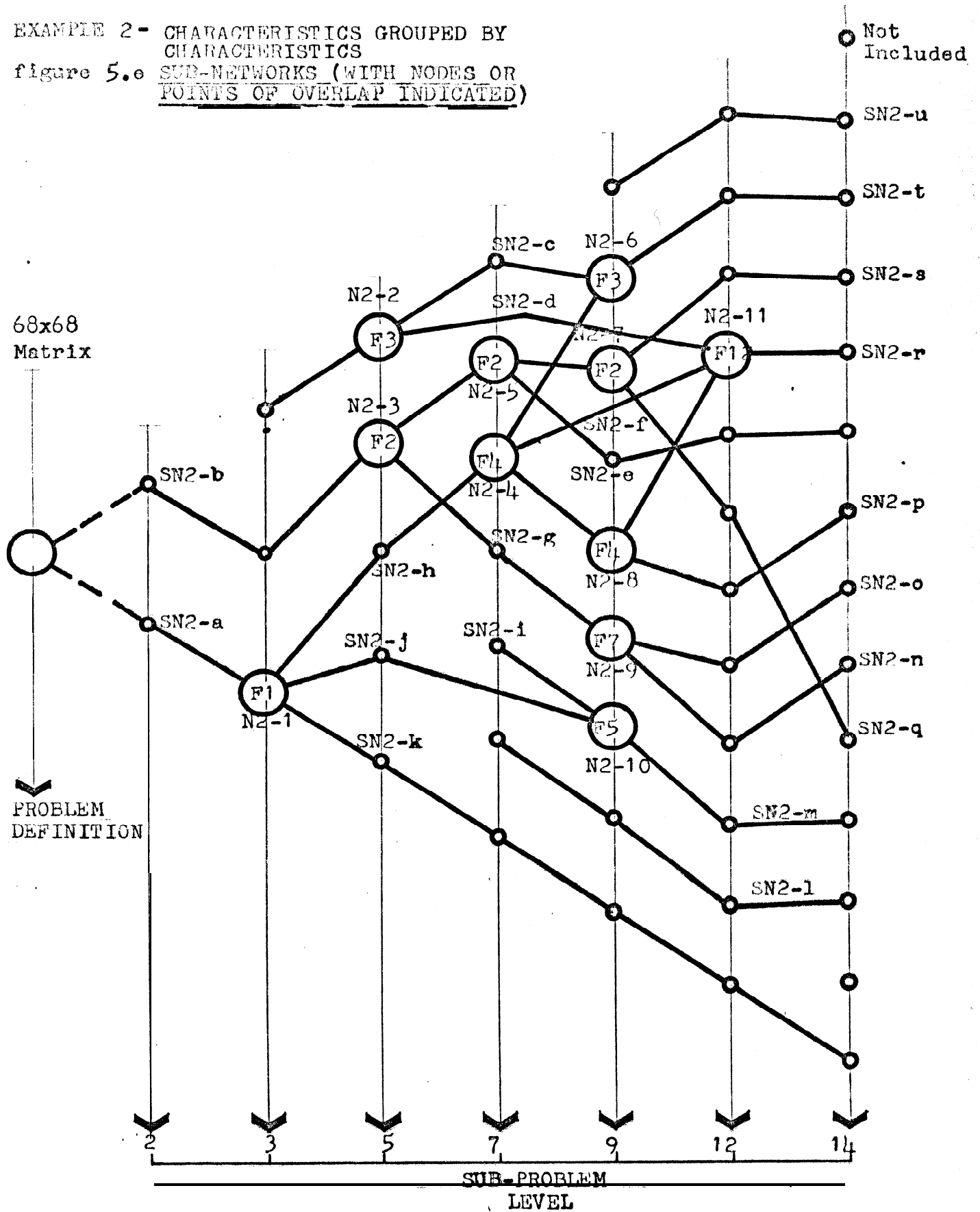
NODES

- N3 - 1 Youths Unmarried, Children.
- N3 - 2 Permanent Adult Peoples and Community Clubs,

Sub-Networks

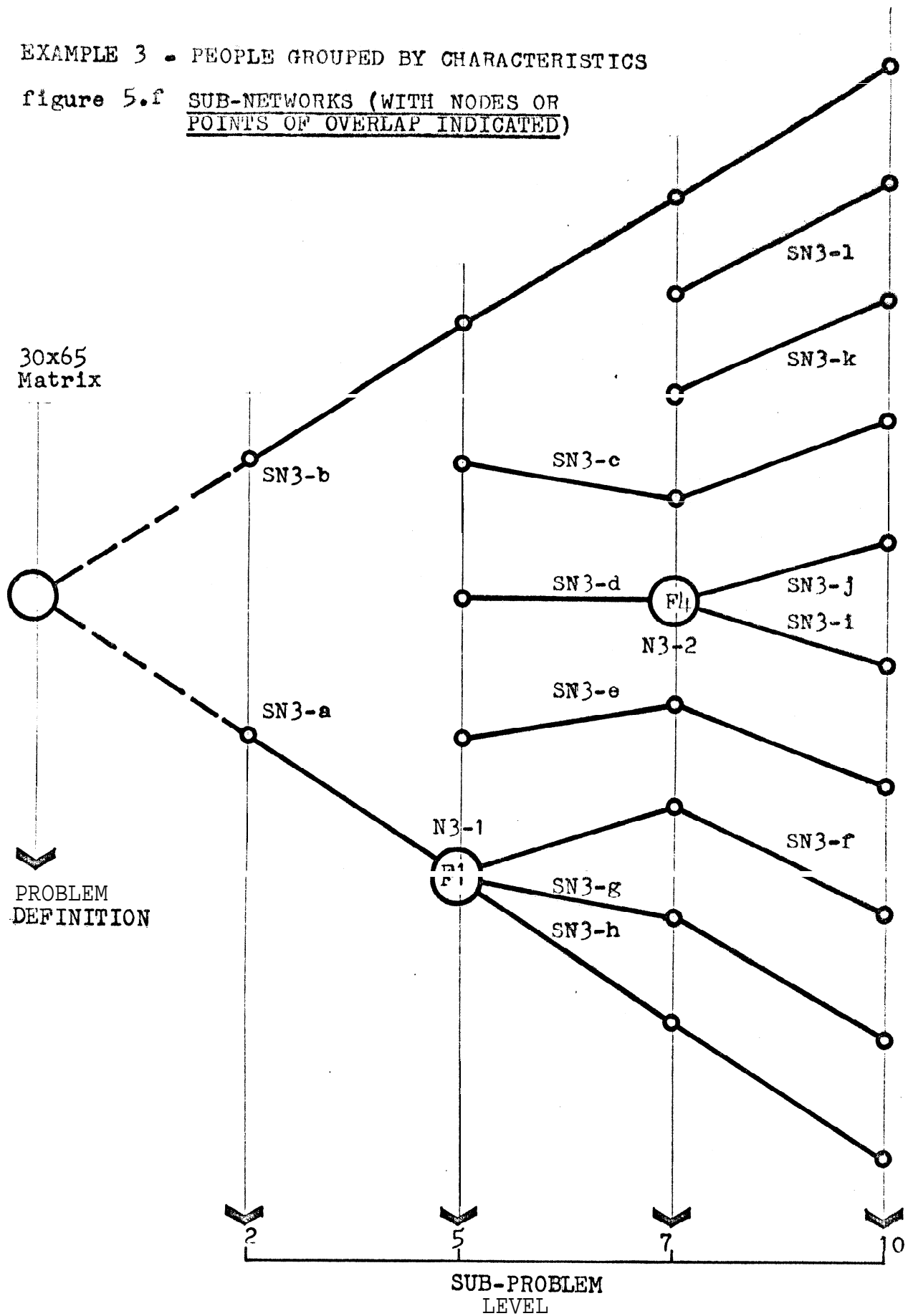
- SN3 - a Youths, Unmarried, Children.
- SN3 - b Labor.
- SN3 - c Owner, Manager, Professional.

EXAMPLE 2 - CHARACTERISTICS GROUPED BY CHARACTERISTICS
figure 5.0 SUB-NETWORKS (WITH NODES OR POINTS OF OVERLAP INDICATED)



EXAMPLE 3 - PEOPLE GROUPED BY CHARACTERISTICS

figure 5.f SUB-NETWORKS (WITH NODES OR POINTS OF OVERLAP INDICATED)



SN3 - d Permanent Adult Peoples.
 SN3 - e Transients, Youths, Home Employment,
 SN3 - f Youths (Girls).
 SN3 - g Children.
 SN3 - h Youths, Unmarried.
 SN3 - i Community Clubs.
 SN3 - j Permanent Adult Peoples,
 SN3 - k Membership in Clubs,
 SN3 - l Land Orientated Peoples,

EXAMPLE 4 (refer to figure 5g)

NODES

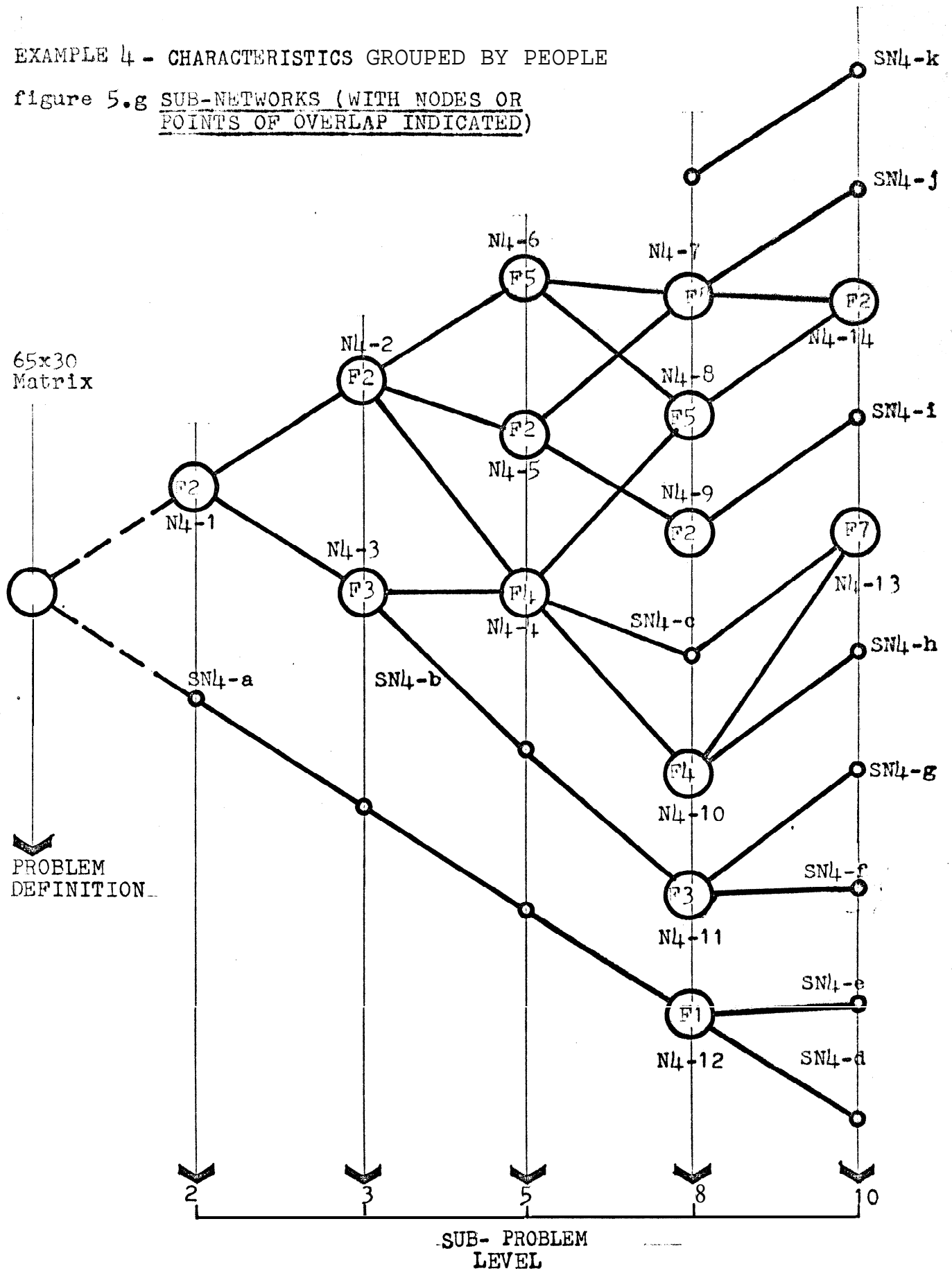
N4 - 1 Health, Safety and Convenience.
 N4 - 2 Health, Convenience, Land Characteristics.
 N4 - 3 General Amenities.
 N4 - 4 Health and General Amenities.
 N4 - 5 Convenience and Land Characteristics.
 N4 - 6 Convenience, Health, Way of Life.
 N4 - 7 Convenience and Way of Life.
 N4 - 8 Health and Convenience.
 N4 - 9 Convenience and Land Characteristics.
 N4 - 10 Health and Convenience.
 N4 - 11 General Amenities,
 N4 - 12 Money and Land,
 N4 - 13 Convenience.
 N4 - 14 Health and Convenience.

Sub-Networks

SN4 - a Money, Trade and Efficiency,
 SN4 - b General Amenities.
 SN4 - c Convenience.
 SN4 - d Money, Trade and Efficiency,,
 SN4 - e Minimum Economic Expenditures,
 SN4 - f Normal Life,
 SN4 - g Land Development Patterns.
 SN4 - h Health and Convenience,
 SN4 - i Conveniences and Land Characteristics.
 SN4 - j Convenience and Way of Life.
 SN4 - k Protection and Work.

EXAMPLE 4 - CHARACTERISTICS GROUPED BY PEOPLE

figure 5.g SUB-NETWORKS (WITH NODES OR POINTS OF OVERLAP INDICATED)



EXAMPLE 5 (refer to figure 5h)

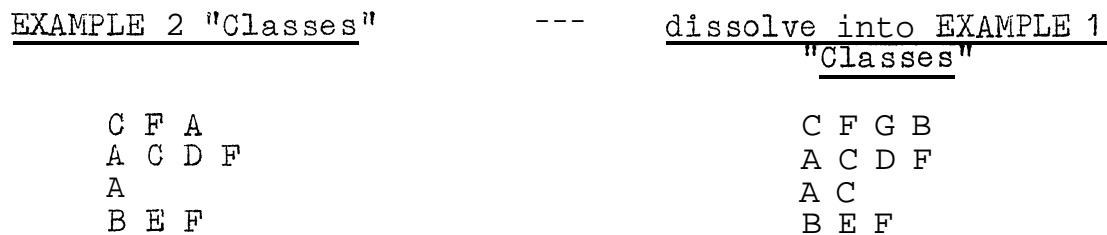
NODES

- N5 - 1 White and Labor.
- N5 - 2 White Youths.
- N5 - 3 Children and Whites,
- N5 - 4 Children and Natives.
- N5 - 5 Children, White Youths (Girls), and Clubs,
- N5 - 6 White Youths.
- N5 - 7 White Youths.
- N5 - 8 Permanent and Transient Whites.
- N5 - 9 Youths, Unmarried (Natives), and Unemployment,
- N5 - 10 White Youths.
- N5 - 11 Children, White Youths (Girls), and Clubs.

Sub-Networks

- SN5 - a Children and Natives.
- SN5 - b White Women and Transient White Couples.
- SN5 - c White Men (Permanent) and Couples (Permanent).
- SN5 - d Children.
- SN5 - e Owner, Manager, Professional, and Club Membership.
- SN5 - f Permanent and Transient Whites.
- SN5 - g Vocational Students.
- SN5 - h Native Couples and Youths.
- SN5 - i Unmarried Native Men.
- SN5 - j Youths, Unmarried Natives, and Unemployment.

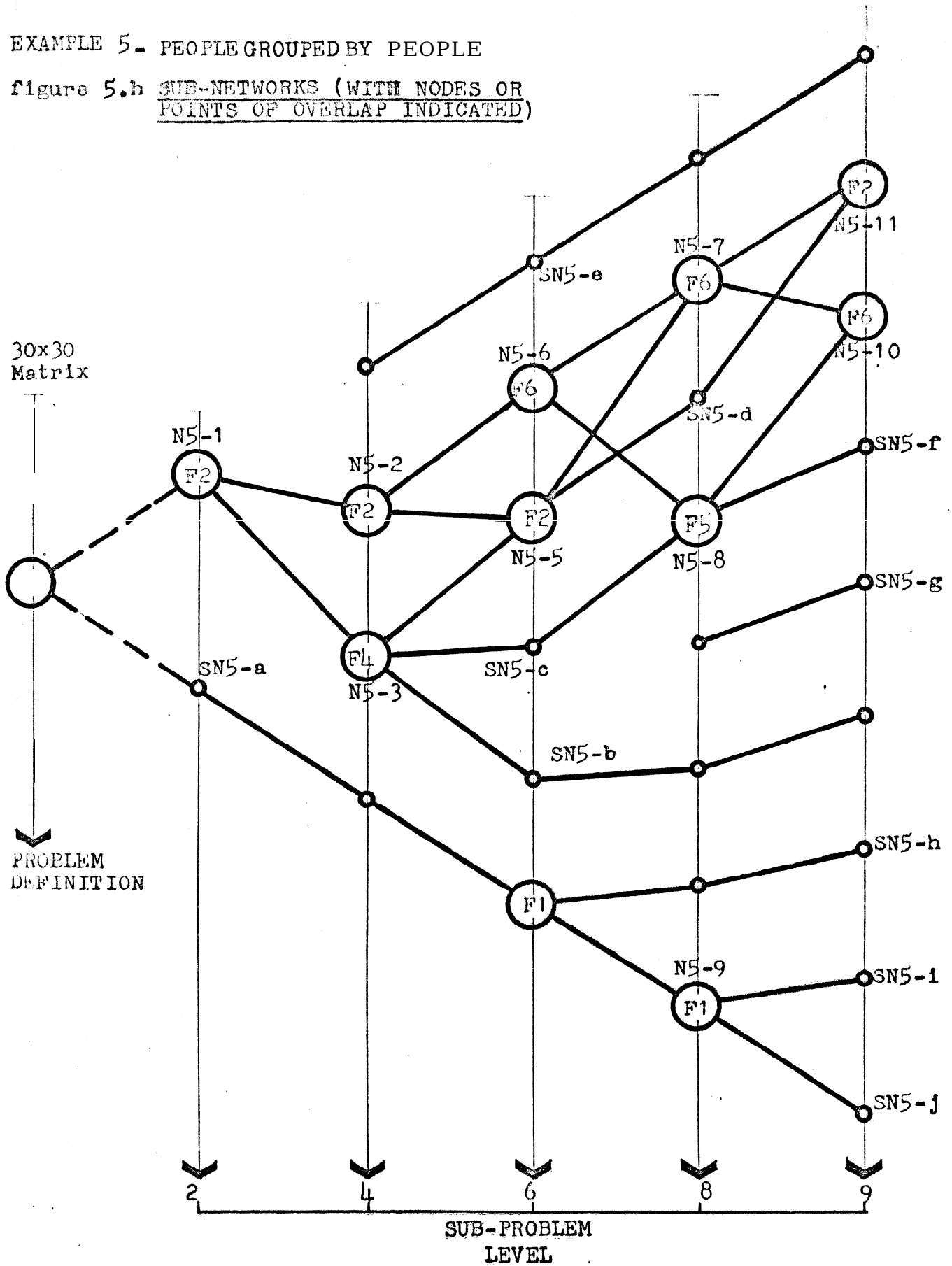
In comparing the patterns of the EXAMPLES 1-5, the component groupings of all of the EXAMPLES 2-5 inclusive can general-f-y be "dissolved" into the component groupings in EXAMPLE 1. Refer for instance, to figures 5i and 5j, and to the following diagram:



It would appear, therefore, that the main advantage of the EXAMPLES 2-5 Inclusive is to clarify, (by restricting the number of considerations), the component and factor groupings of EXAMPLE 1.

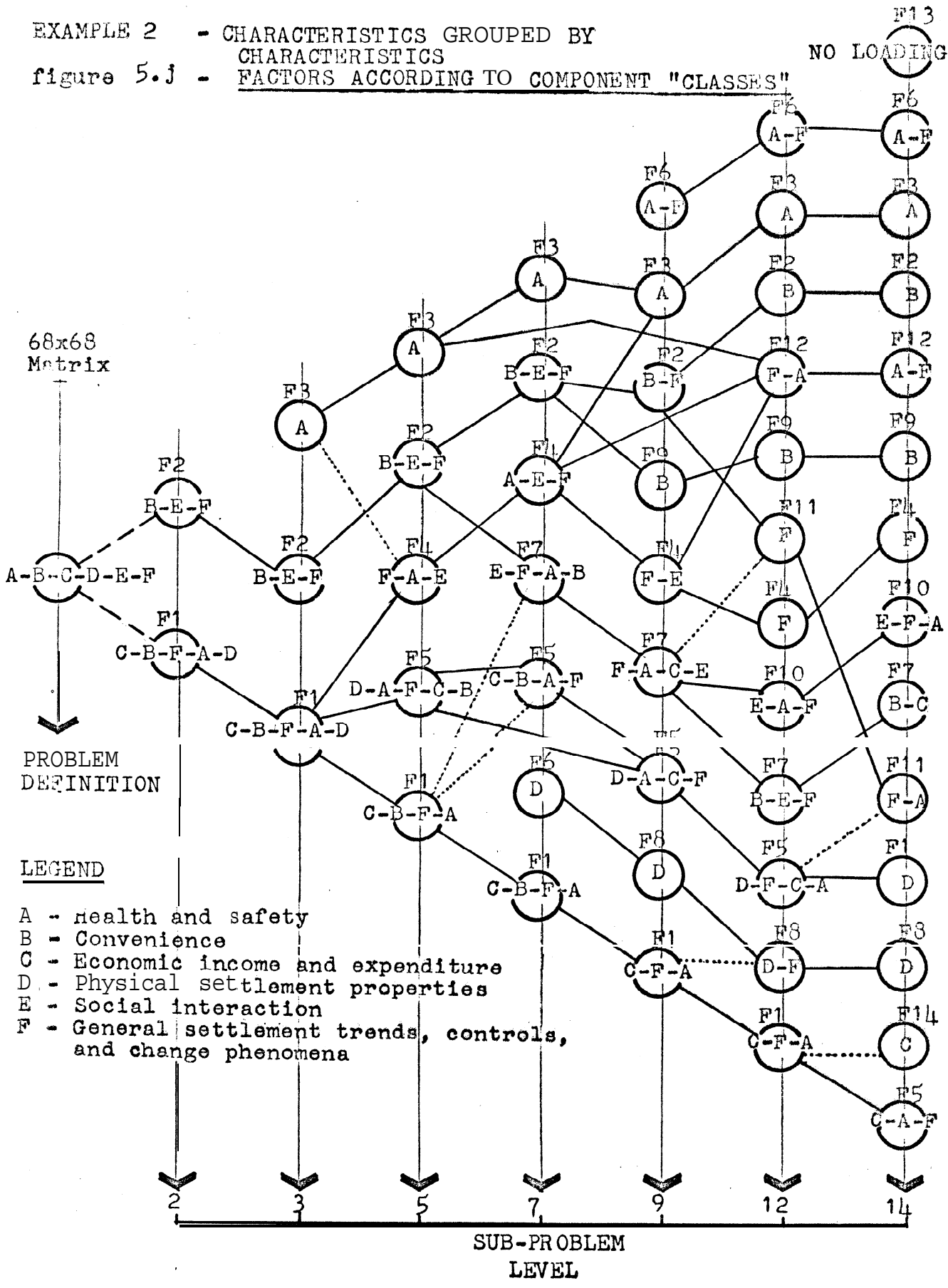
EXAMPLE 5 - PEOPLE GROUPED BY PEOPLE

figure 5.h SUB-NETWORKS (WITH NODES OR POINTS OF OVERLAP INDICATED)



EXAMPLE 2 - CHARACTERISTICS GROUPED BY CHARACTERISTICS

figure 5.j - FACTORS ACCORDING TO COMPONENT "CLASSES"



CHAPTER SIX / RECOMMENDATIONS AND CONCLUSIONS

6.1 The Methodology: Generating And-Recommending Alternatives

Following from the "interpretation of sub-systems" phase of the example, a number of observations and proposals can be made regarding the settlement of Inuvik. These observations and conclusions represent a further synthesizing step before the "implementation" stage, and are derived from:

- 1) the node and sub-network patterns.
- 2) the factors which make up these nodes and sub-networks.
- 3) the components which constitute each factor,
- 4) the original selection of components and determination of component interaction,

It is important to note that these observations and proposals indicate general constraints on the formulation of specific solutions to settlement planning problems in the Mackenzie River Delta, rather than specific solutions as such: also, they represent related, specific, and unique needs and desires of the local peoples.

While a great number of specific observations could be made from the foregoing analysis, in order to exemplify here this phase of the methodology a few typical observations, proposals, and their implications are given:

- 1) OBSERVATION: permanent residents, transient residents,

and combined transient-permanent residents each form relatively discrete patterns (refer to figures 6a and 6b).

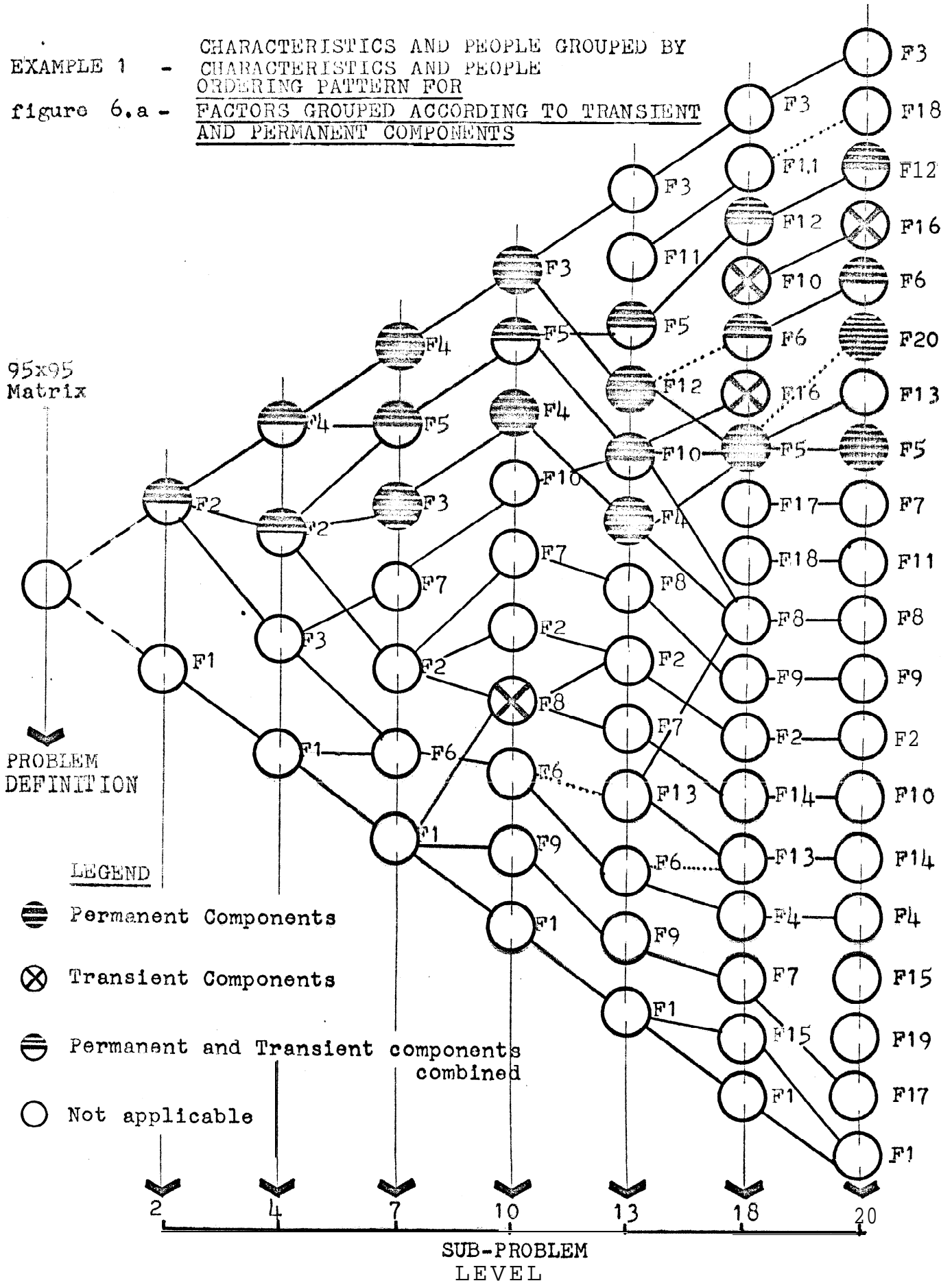
PROPOSAL AND IMPLICATIONS: although the "split" between permanent and transient residents has already been pointed out by many other researchers (Lotz, 1962b; Mailhot, 1966; Wolforth, 1967), this study indicates certain factors which underlie this "split", and shows its relationship to other settlement issues. The implications of this "split" lead to a need for a policy decision between:

i) being aware of the "split", but ignoring this "split" in planning terms (eg, by providing only "southern" type subdivisions with no alternatives available; by providing only "bush" type living accommodation with no alternatives available, etc.).

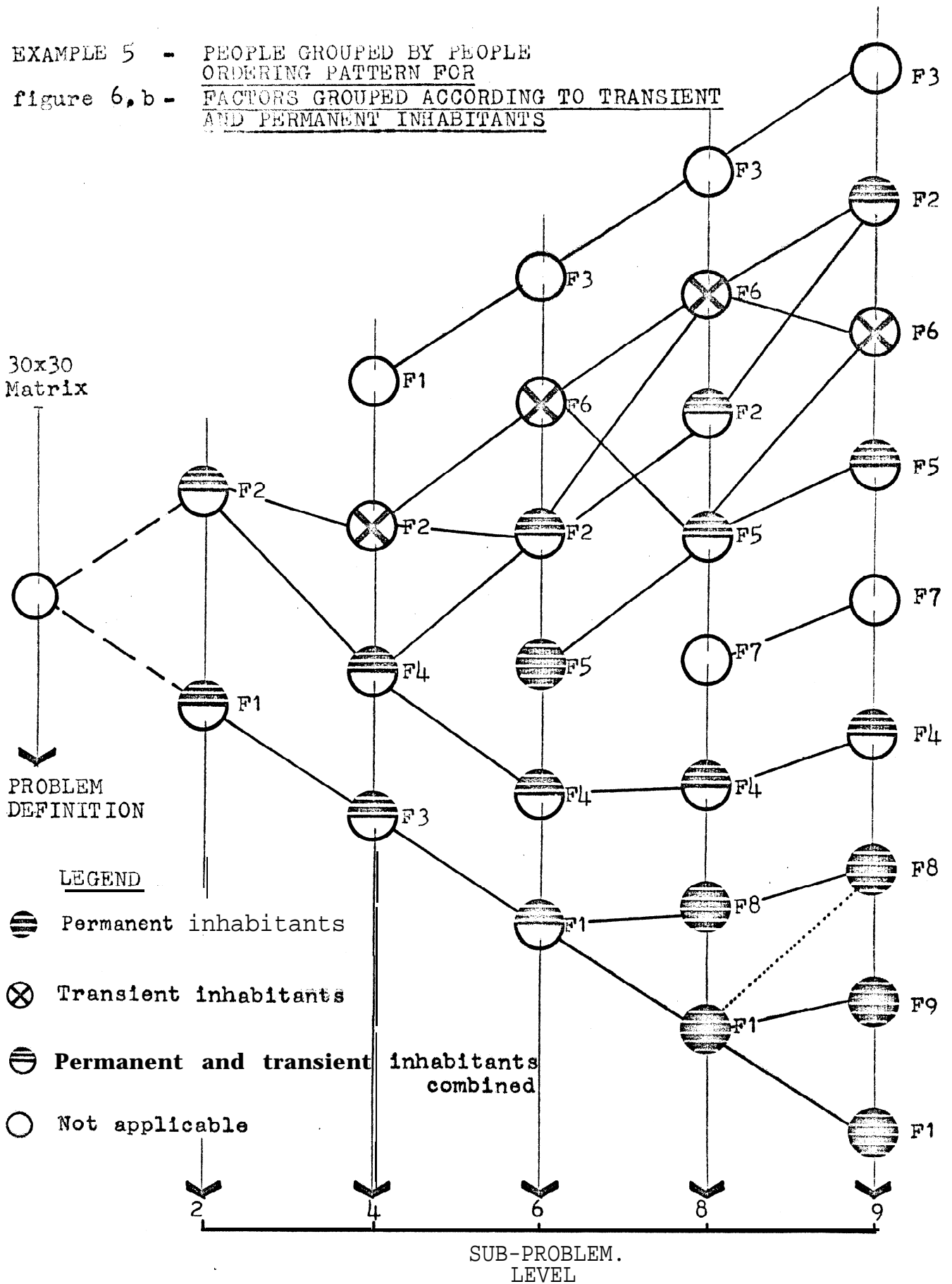
The author infers from the policy and action to date that this general course has been adopted by the governing bodies (eg. no allocation of land use areas for tying and feeding dogs; no provision for docking small boats; etc.). With this approach, the resulting economic and social costs have been and will continue to be extremely high, with few, if any, collective benefits (Lotz, 1962b). This is a negative, "laissez-faire" approach rather than a "directed-action" approach.

ii) an acknowledgment of an essentially tri-partite

EXAMPLE 1 - CHARACTERISTICS AND PEOPLE GROUPED BY ORDERING PATTERN FOR
 figure 6.a - FACTORS GROUPED ACCORDING TO TRANSIENT AND PERMANENT COMPONENTS



EXAMPLE 5 - PEOPLE GROUPED BY PEOPLE
 ORDERING PATTERN FOR
 figure 6,b - FACTORS GROUPED ACCORDING TO TRANSIENT
 AND PERMANENT INHABITANTS



division of permanent, transient, and combined transient-permanent groups; attempting to meet the separate and diverse needs of these groups and to use only what is common to these groups as the cohesive, binding factor, The author suggests that this approach offers the greatest potential for positive community development in Inuvik. **It** must be noted, however, that this tri-partite division should in no way be considered a rigid, permanent division; rather, it should be considered a "natural" division only at this particular time and to satisfy specific needs and desires. The Inuvik situation must be continually reevaluated through time as the needs and desires of each group change, and the subsequent policy decisions updated on the basis of this reevaluation.

Mailhot, a sociologist who completed, during the summer of 1965, a study of the community structure in Inuvik, stated that administrative authorities should recognize two communities rather than one community in Inuvik, and that a community development program be set up with this two-part community as its basic assumption (Mailhot, **1966**). However, it appears while a two-part community may satisfy certain criteria identified in the author's study, other criteria will necessarily be negated. Since the premise of this study has been that solutions should identify with the criteria which they are intended to satisfy, the author

suggests that this premise leads in this case to a multi-part community needing a multi-part solution to satisfy the "compatible" criteria groups.

2) OBSERVATION: while "white" and "native" adult components each form relatively discrete sub-network patterns, the common components between these "native" and "white" groups are discovered to be the children components, In EXAMPLE 1, for instance, this occurs at the following locations in the sub-network patterns (refer to figure 6c):

- sub-problem level 2-F2
- sub-problem level 4-F2
- sub-problem level 7-F5
- sub-problem level 10-F5

In the sub-problem levels 13, 18 and 20, the "children" components occur as a unique factor at the following locations in the sub-network patterns:

- sub-problem level 13-F5
- sub-problem level 18-F12
- sub-problem level 20-F12

This indicates that in certain respects the "children" components also have unique needs and desires,

It should be noted that the "children" components were not originally divided into "white" and "native" but rather into "local" and "non-local" (refer to Section A of Appendices One, Two, Four and Five, and

EXAMPLE 1 - CHARACTERISTICS AND PEOPLE GROUPED BY
 CHARACTERISTICS AND PEOPLE
 ORDERING PATTERN FOR
 figure 6.c - FACTORS GROUPED ACCORDING TO
NATIVE AND WHITE COMPONENTS

95x95
Matrix

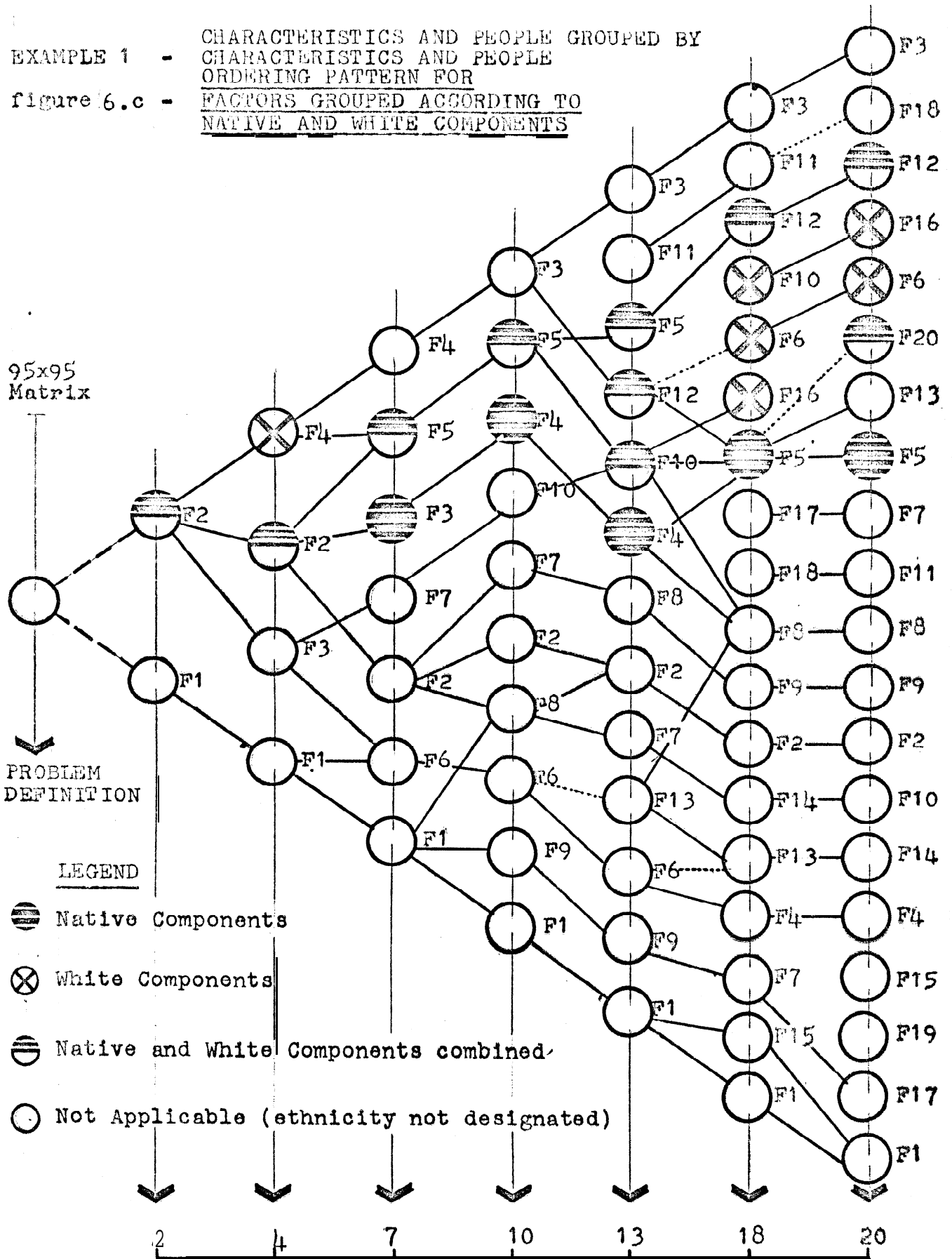
PROBLEM
DEFINITION

LEGEND

- ⊖ Native Components
- ⊗ White Components
- ⊕ Native and White Components combined
- Not Applicable (ethnicity not designated)

2 4 7 10 13 18 20

SUB-PROBLEM
LEVEL



to the Final List of 95 Components in Section 5.2i). During the selection and definition of the list of components, the author concluded that a "local" and "non-local" division was more meaningful for the "children" components in this study than a "native" and "white" division. This conclusion was based on:

- the author's field observation in Inuvik during the summer of **1966**.
- Mailhot's statements (Mailhot, **1966**) that:
 "Friendly informal relations take place among high school students regardless of ethnic status. They were seen together at the hotel cafe, on the street, on the church steps after Sunday mass, and in the movie theatre lobby. In the school itself, except for the few "sophisticated" white girls, friendships are established regardless of ethnic lines, and "steady" relationships sometimes exist between teen-age students of different ethnic groups: (This is a good example of how descriptive information provided by a "planning team member" can influence a planning decision..).

It should also be noted that the author's observation during the summer of **1966**, regarding interaction between primary school children of different backgrounds, generally contradicted with Mailhot's conclusion that "The informal organization of games,....., generally did not cross over ethnic barriers, although

the situation slightly differed from group to group" (Mailhot, 1966). The authors observation was that the interaction between primary school children in both organized and spontaneous recreational and social activities was, with the exception of a definite religious division; generally very flexible and multi-ethnic.

PROPOSAL AND IMPLICATIONS: a policy decision can now be made between:

- i) consciously attempting to reinforce this "white-native" split by dividing the "children" component into segregated "native" and "white" components. In this way, minimal interaction would take place between "white children" and "native children",
- ii) the "children" components can be used as a bond between the "white" and "native" components, With this approach, the design for multi-ethnic educational, social, and recreational facilities becomes important.

3) OBSERVATION: one sub-network is called the "Unsettled Native Peoples" (figure 5d: SN1-b). It includes the following components:

- Native boys 16-21.
- Unmarried native men (over 21).
- Non-local married native couples.
- Unemployment,
- Allowing fringe developments to occur.
- Native girls **16-21**.
- Unmarried native women (over 21).
- Nearness to water vehicular systems.
- Diversification in industry.
- Freedom from ethnic conflict,
- Unskilled labor.

PROPOSAL AND IMPLICATIONS: this sub.-network exemplifies the situations encountered when the process of **social** urbanization lags behind a geographical concentration: when the more basic human requirements are not adequately recognized in the process of transformation from a land-orientated, "primitive" society to an industrialized, modern, urban one. This is exemplified throughout the world by squatters', settlements surrounding the urban areas, and exists around the settlement of Inuvik as well. A number of persons have proposed as a solution a unique settlement area with which the "unsettled native peoples" could identify, which would have facilities to aid during this transitional phase: an adequate water supply; a number of tent "pads" near the river; portable, expandable living units; a youth hostel. However, whatever the solution, it is significant that in this study this particular social group is selected as having specific needs and requirements which must have a direct bearing on the planning of the town if these needs and requirements are to be considered. It is also significant to note that a survey by Lotz (Lotz, 1962b) concluded that this "Unsettled Native Peoples" group wanted the following improvements, in order of preference:

- a) water supply
- b) garbage collection
- c) electricity

- d) access roads
- e) police patrols
- f) simple materials supplied for housing construction

Such a survey is a very good example of the role that a "team" member can assume within a multi-disciplinary planning team concept,

4) OBSERVATION: a "Land Orientated Peoples" (figure 5d: SN1-x; figure 5e: SN3-1) sub-network is identified, consisting of the following components:

- self-employed as harvester of natural resources
- unemployment

Present facilities in Inuvik do not provide for these part-time residents, While in a settlement these residents are generally associated with the "squatters" and live in relatively "primitive", unserviced houses and tents,.

PROPOSAL AND IMPLICATIONS: the needs and desires of this particular group are at present largely neglected in both the rural and urban environment. If this present situation persists, it is likely that this "land-orientated" group will soon be forced into an urban setting with which they possibly cannot learn to cope. On the other hand, if the intent is to encourage the development of this particular way of life, it will be necessary to offer added social and

economic support for these peoples. This will first require a clear identification of the specific needs and desires of this group, followed by means for satisfying these needs and desires,

During the summer of 1966, the author attended a meeting where a number of "land-orientated" families appealed to the Federal Government for equal assistance to build a home, whether it be located in a settlement or in the "bush". It is appeals such as this which will have to be met if the "land-orientated" way of life is to continue.

- 5) OBSERVATION: the "clubs/associations" components related most strongly to the "white", "manager", "owner" and "professional" social groups, This suggests a certain "gap" between the needs of the remaining social groups and their organized activities.

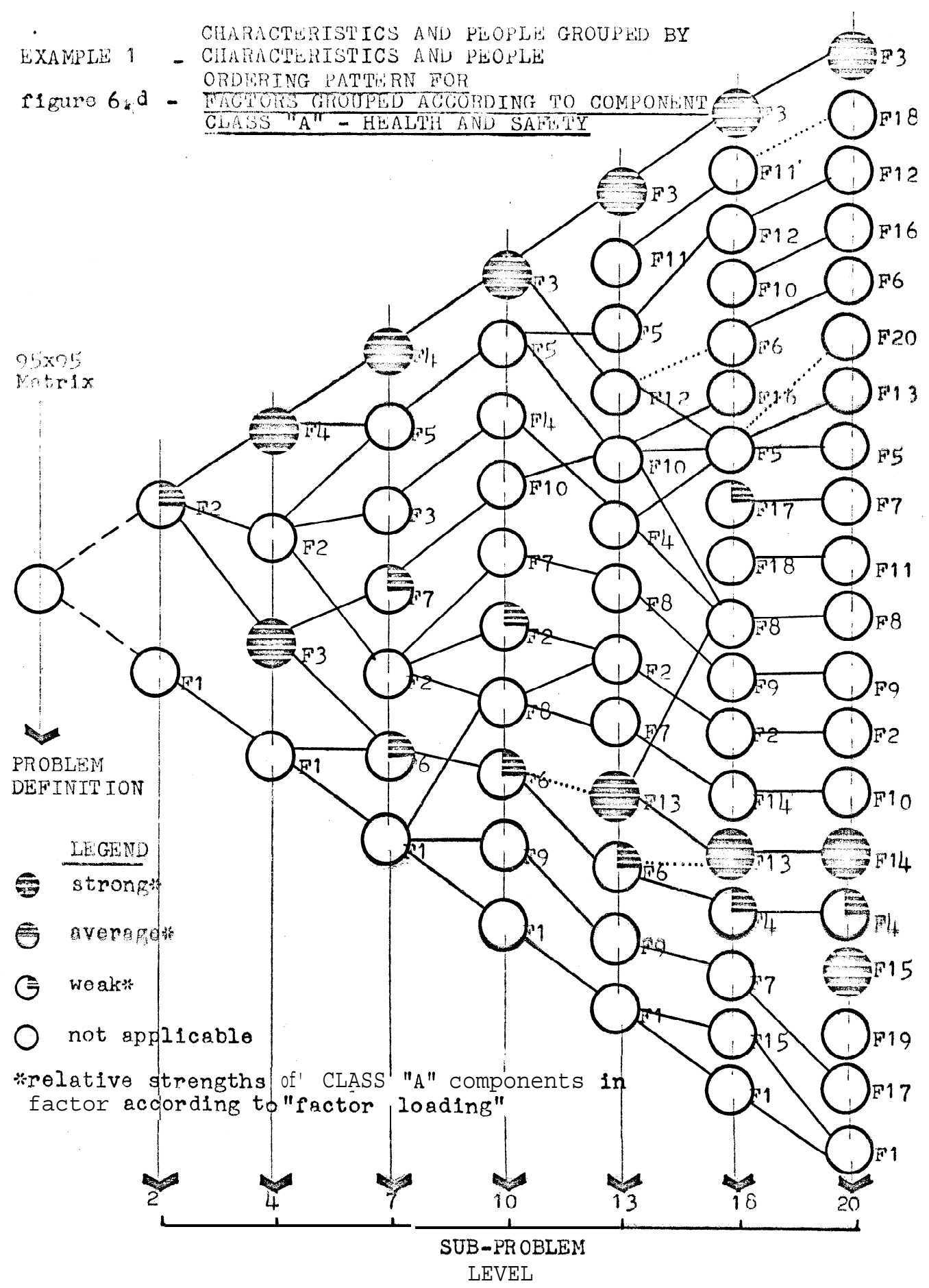
PROPOSAL AND IMPLICATIONS: if the present trends are allowed to continue, it is likely that the organized activities in Inuvik will continue to satisfy the needs and desires of only a portion of the settlement's inhabitants. The situation will, therefore, continue to initiate a sense of social discontent. The other alternative, however, is to attempt to equally satisfy the needs and desires for organized activities of all the representative social groups. This will require a sincere appreciation and accurate evaluation

of the cultural and social activities and aspirations of each social group. The author proposes that a planning team composed of representatives of all local social groups and researchers trained in the study of social relationships and individual development could best approach this problem,

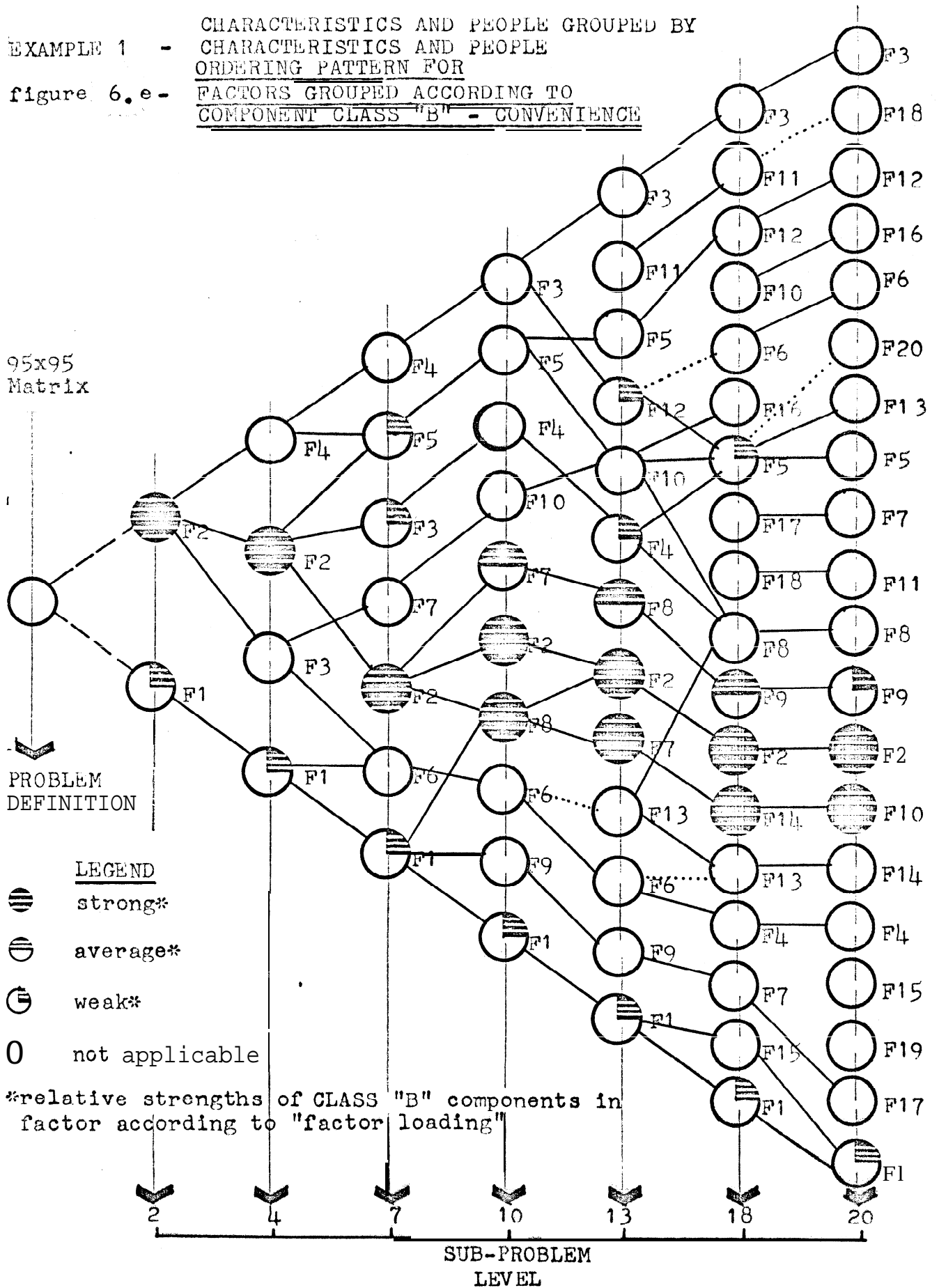
- 6) OBSERVATION: each of the original component classes (see Section 5.2i) forms relatively discrete sub-networks and nodes in the interaction analysis,, **In** order to signify the relative importance of these patterns to the over-all problem, the patterns can be designated as "strong", "average" and "weak" according to the strengths of the factor loadings. This is shown for EXAMPLE 1 in figures 6d,6e, 6f,6g, 6h, 6i, and 6j. The other EXAMPLES, 2 and 4, (which each contain more than one component class), can be shown to yield similar patterns.

PROPOSAL AND IMPLICATIONS: the above observation may tend to suggest that by dividing components into classes at an early stage of the problem-solving procedure, the planning team member is establishing a predetermined solution. However, this is not true, since the sub-network patterns are derived entirely from the components and their interaction, with the division into component classes acting as a convenient, all-encompassing checklist for the team members,,

EXAMPLE 1 - CHARACTERISTICS AND PEOPLE GROUPED BY
 ORDERING PATTERN FOR
 figure 6.4d - FACTORS GROUPED ACCORDING TO COMPONENT
 CLASS "A" - HEALTH AND SAFETY



EXAMPLE 1 - CHARACTERISTICS AND PEOPLE GROUPED BY
 ORDERING PATTERN FOR
 figure 6.e - FACTORS GROUPED ACCORDING TO
 COMPONENT CLASS "B" - CONVENIENCE



EXAMPLE 1 - CHARACTERISTICS AND PEOPLE GROUPED BY
 CHARACTERISTICS AND PEOPLE
 ORDERING PATTERN FOR
 FIGURE 6.f - FACTORS GROUPED ACCORDING TO
 COMPONENT CLASS "C" - ECONOMIC
 INCOME AND EXPENDITURE

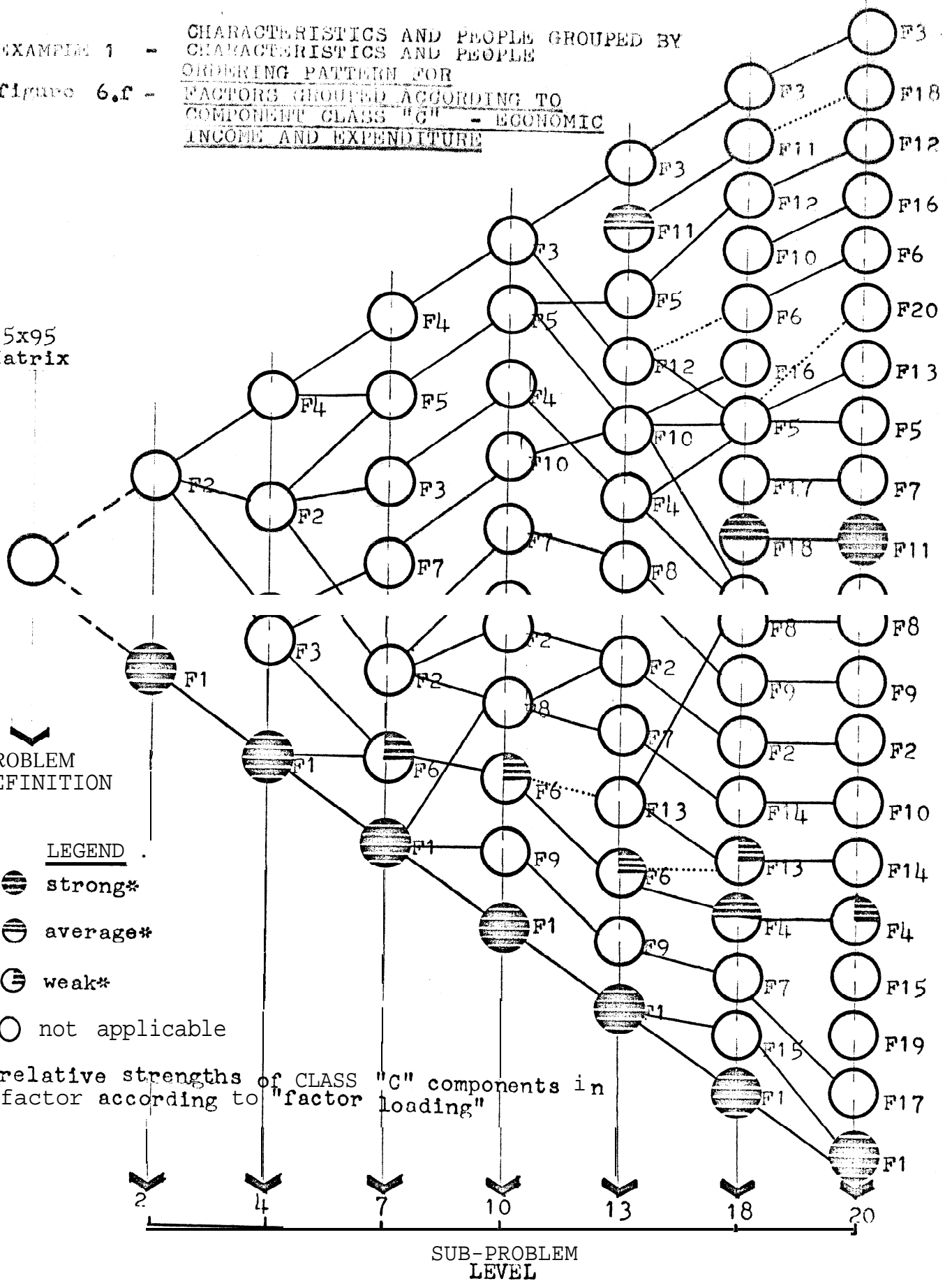
95x95
Matrix

PROBLEM
DEFINITION

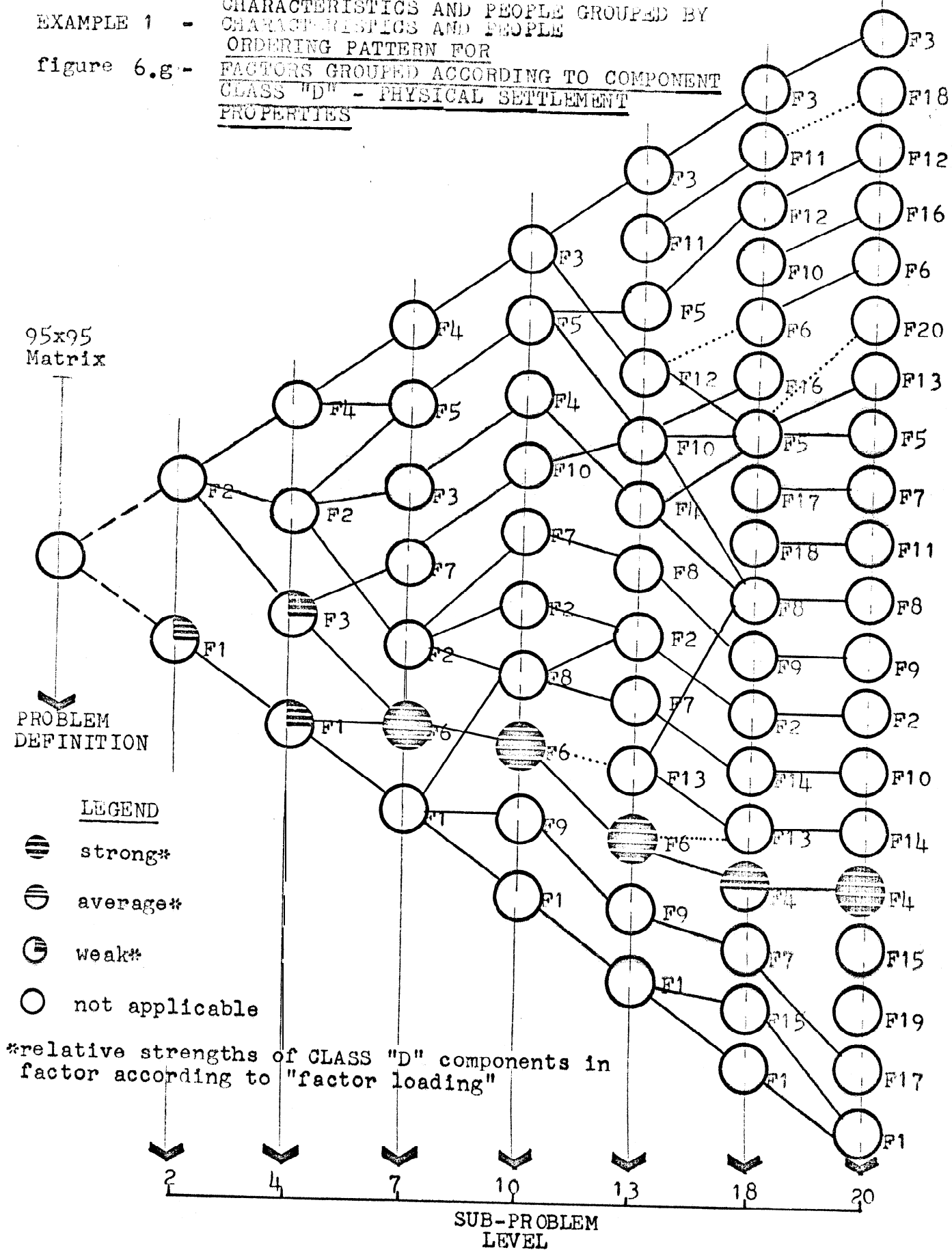
LEGEND

- ⊖ strong*
- ⊕ average*
- ⊗ weak*
- not applicable

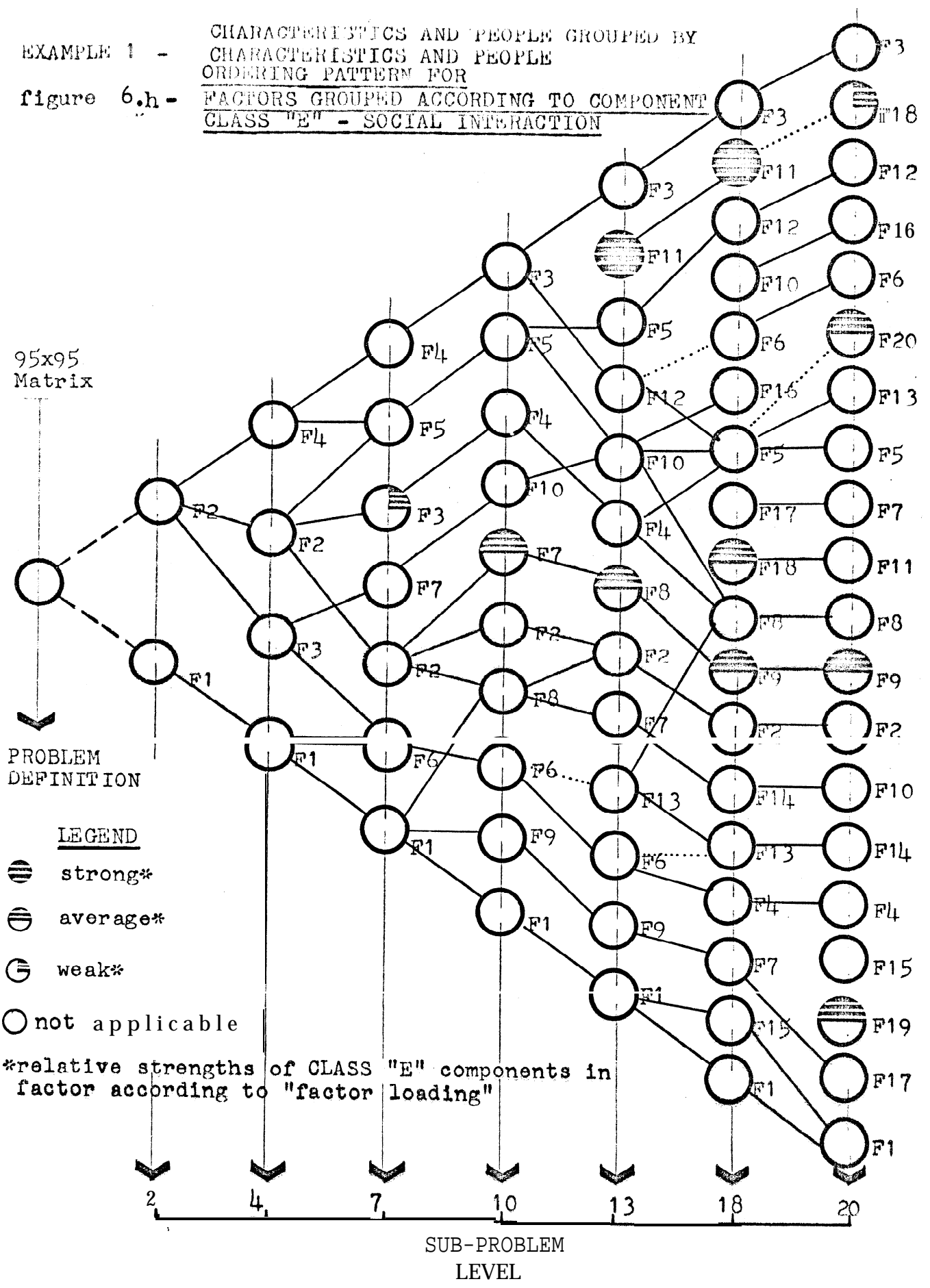
*relative strengths of CLASS "C" components in
factor according to "factor loading"



EXAMPLE 1 - CHARACTERISTICS AND PEOPLE GROUPED BY
 CHARACTERISTICS AND PEOPLE
 ORDERING PATTERN FOR
 figure 6.g - FACTORS GROUPED ACCORDING TO COMPONENT
CLASS "D" - PHYSICAL SETTLEMENT
PROPERTIES



EXAMPLE 1 - CHARACTERISTICS AND PEOPLE GROUPED BY
 CHARACTERISTICS AND PEOPLE
 ORDERING PATTERN FOR
 figure 6.h - FACTORS GROUPED ACCORDING TO COMPONENT
 CLASS "E" - SOCIAL INTERACTION



95x95 Matrix

PROBLEM DEFINITION

LEGEND

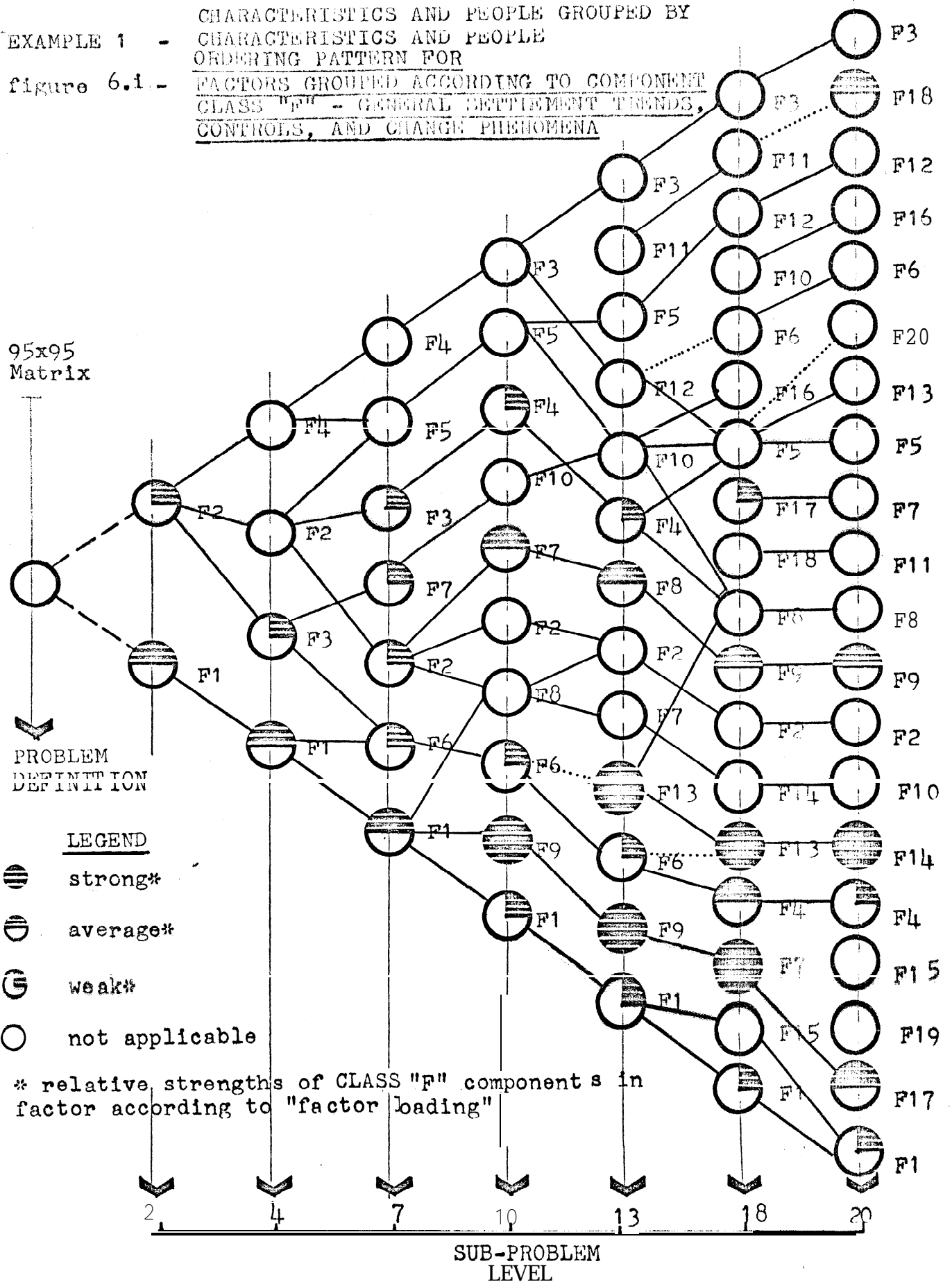
- ⊖ strong*
- ⊖ average*
- ⊖ weak*
- not applicable

*relative strengths of CLASS "E" components in factor according to "factor loading"

2 4 7 10 13 18 20

SUB-PROBLEM LEVEL

EXAMPLE 1 - CHARACTERISTICS AND PEOPLE ORDERING PATTERN FOR
 figure 6.1 - FACTORS GROUPED ACCORDING TO COMPONENT CLASS "F" - GENERAL SETTLEMENT TRENDS, CONTROLS, AND CHANGE PHENOMENA



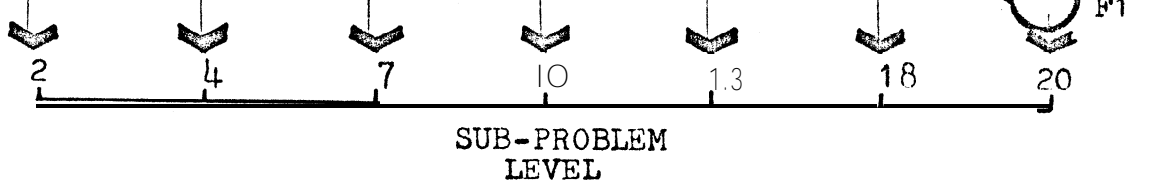
EXAMPLE 1 - CHARACTERISTICS AND PEOPLE GROUPED BY
 ORDERING PATTERN FOR
 figure 6.j - FACTORS GROUPED ACCORDING TO COMPONENT
 CLASS "G" - SOCIAL GROUPS

95x95
 Matrix

PROBLEM
 DEFINITION

- LEGEND
- strong*
 - ◐ average*
 - ◑ weak*
 - not applicable

*relative strengths of CLASS "G" components in
 factor according to "factor loading"



In this way, the team member is at least aware of those categories of components which he chooses to disregard, and of those which he chooses to include,.

The discrete patterns of components from the same classes indicate that the solutions for a particular component class are compatible within themselves, but are fully or partly incompatible with the solutions for other component classes. This means for example, that while solutions for the components "protection against contagion" and "unpolluted ground water supply" (from the same "Health and Safety component class) would work well together, these solutions would partly or fully counter the solutions for a component such as "minimum operating costs" (from the Economic Income and Expenditure" component class),

These six general observations exemplify the potential to the field of settlement planning of this particular application of the methodology. This example is in no way meant to be "complete" or to "solve" all of the settlement planning problems: the basic input of information in this example could undoubtedly be contested; possibly the economic,, more tangible class of components has been emphasized to the detriment of the more human, Intangible components; certain component groupings seem to be ambiguous (see EXAMPLE 1, sub-problem level 7,F7). However, herein lies the primary merit of such an organizing framework: it makes public the criteria on which the planning decisions are made, and offers the

implications of these planning decisions, The way is now open for research work to further evaluate and develop this general framework into a progressively more realistic and operationally feasible planning tool,,

6.2 The Approach Proposed: An Evaluation

Throughout this study the emphasis has been on the development, application and implications of a specific theory and methodology to the field of settlement planning in the Mackenzie River Delta. Further study is required in order for this approach to become a practical and sophisticated planning tool. Nevertheless, the results of the work to date are encouraging, and suggest that at the present stage of development the approach proposed can be a useful general guide for settlement planners.

The methodology offers potential for a number of significant advantages over the more traditional planning approaches. As a reiteration of earlier statements, some of these advantages

are:

A, Characteristics of the Methodology:

- the methodology attempts to consider the principal elements of a problem and the main ramifications of any number of courses of action.
- by systematically determining component interaction and sub-network patterns, the methodology produces a tendency to look in an orderly way for relationships which might ordinarily be overlooked. The error of

- isolated cause-and-effect thinking is avoided,
- the methodology allows one to test from a "total" or "holistic" viewpoint what might happen to the system if some component or interaction changes.
 - the methodology allows for a comprehensive approach within its general structuring framework.
 - the methodology is an innovative rather than an imitative planning approach.
 - accepting that the cognitive capacity of a human being is limited, the methodology allows one to extend this capacity,,

B. Application of the Methodology:

- each decision is explicitly stated, thereby acting as a constant check for the decision-maker. Such an approach encourages objectivity, making errors and personal biases and deficiencies more obvious, It also allows one to justify what is included in the observation and interpretation of information, and what is temporarily excluded.
- since the problem is divided into small, manageable, "bits" of information, the methodology allows for a freer and more efficient multi-disciplinary interaction,
- by regularly reevaluating the components and component interaction and obtaining a new resulting pattern, the methodology allows one to categorize what is relatively enduring and stable,, or what is changing

in the situation..

- the methodology delimits the role of individual participants in relation to the total planning process and in accordance to defined goals and objectives, It, therefore, allows for greater efficiency in the utilization and manipulation of design resources.

- the methodology makes public the procedures, responsibilities, and progress of planning endeavors, thereby allowing for greater public participation.

In order to further develop the potential of the methodology as a planning tool, and to further develop planning in general in the Worth, the author suggests that the following research be initiated:

1) a study of the processes of planning in the Mackenzie River Delta. Although the theoretical development of the methodology presents planning as a continuous, iterative process, this continuity and iteration is largely lacking in operational terms.

Further basic and applied research is therefore required to establish an efficient, interacting, multi-loop, feedback system, and to develop procedures for maintaining the continuity of planning as a process.

2) a study of the effect of using different scale ratings in determining matrix interaction.

3) a study of the relationships between the number of components for each class and the effect which each class has on the over-all sub-network patterns,

4) a study to determine if the factor loading cut-off point, which yields unique factors [see Section 5.2iii) is related to the variance in the loading of each factor.

5) development of a technique for a direct, graphic, computer output of the sub-system patterns according to specified criteria. The author feels that a graphic output offers the greatest potential as a means of communication between a large number of persons with varied training and backgrounds,

6) a study to set up an efficiently working communication system between all members of the planning team in general, and in particular, between the "professional" team members and the local inhabitants of a settlement.

7) the author, during this study, noted that while a great deal of "planning" information is available, little of this information is in a readily usable form to a planning team member. It is therefore proposed, that a central data system be established, based at first on the existing accounting and record-keeping facilities used for administrative purposes, and including information such as:

- demographic compositions of all areas in the Mackenzie River Delta at any time.
- through-school, transfer, and other records showing movement of people and families from district to district, together with economic, social and educational characteristics of the

movers.

- a properties file containing information on activities concerning each parcel of land: employment, traffic generation, net profits, etc..

In order to benefit from such a system, the planning team must know for what purposes they will use the data, other than for a description of current trends. This, therefore, means that the data must be in a readily accessible form, and that definitions of goals, measures of efficiency, measures of correlation, theories of settlement growth, and other analytical and synthesizing insights are needed in order to use such data. In terms of individual and collective human rights, this also means that, before the data system is established, all persons involved in or affected by the use of this data must have a clear idea of the potential and limitations of such data. The public must then make the final decision of whether or not such a data system is to be established, and decide what is to be included in this system.

6.3 Conclusion

The Mackenzie River Delta settlements are in a period of rapid transition. Whether or not a process of development which leads to an increasing self-sufficiency and to a sense of belonging to a "community" can be sustained, depends to a large extent on the recognition and fulfillment of the

needs and desires of the local inhabitants. It is, therefore, necessary to take these needs into account through the different stages of development of each culture. And, in order to do this, it is necessary to draw up a strategy to guide these transitions, a strategy which facilitates these transitions with maximum efficiency and minimum social cost. The Mackenzie River Delta is in many ways in a very favourable position in this regard. Since settlement planning is relatively new to this area, the possibilities for planning are not yet totally limited by predetermined principles and concepts. The manageable size of the Delta allows the most modern methods of investigation, of testing, and of compiling and processing data to be utilized to the greatest advantage. The Mackenzie River Delta peoples are progressive, responsible, and greatly endowed with rich and varied cultural backgrounds. It is hoped that this study will in some way aid in the developmental process of our Northern settlements,

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APPENDIX ONE

EXAMPLE 1 - CHARACTERISTICS AND PEOPLE GROUPED BY
CHARACTERISTICS AND PEOPLE

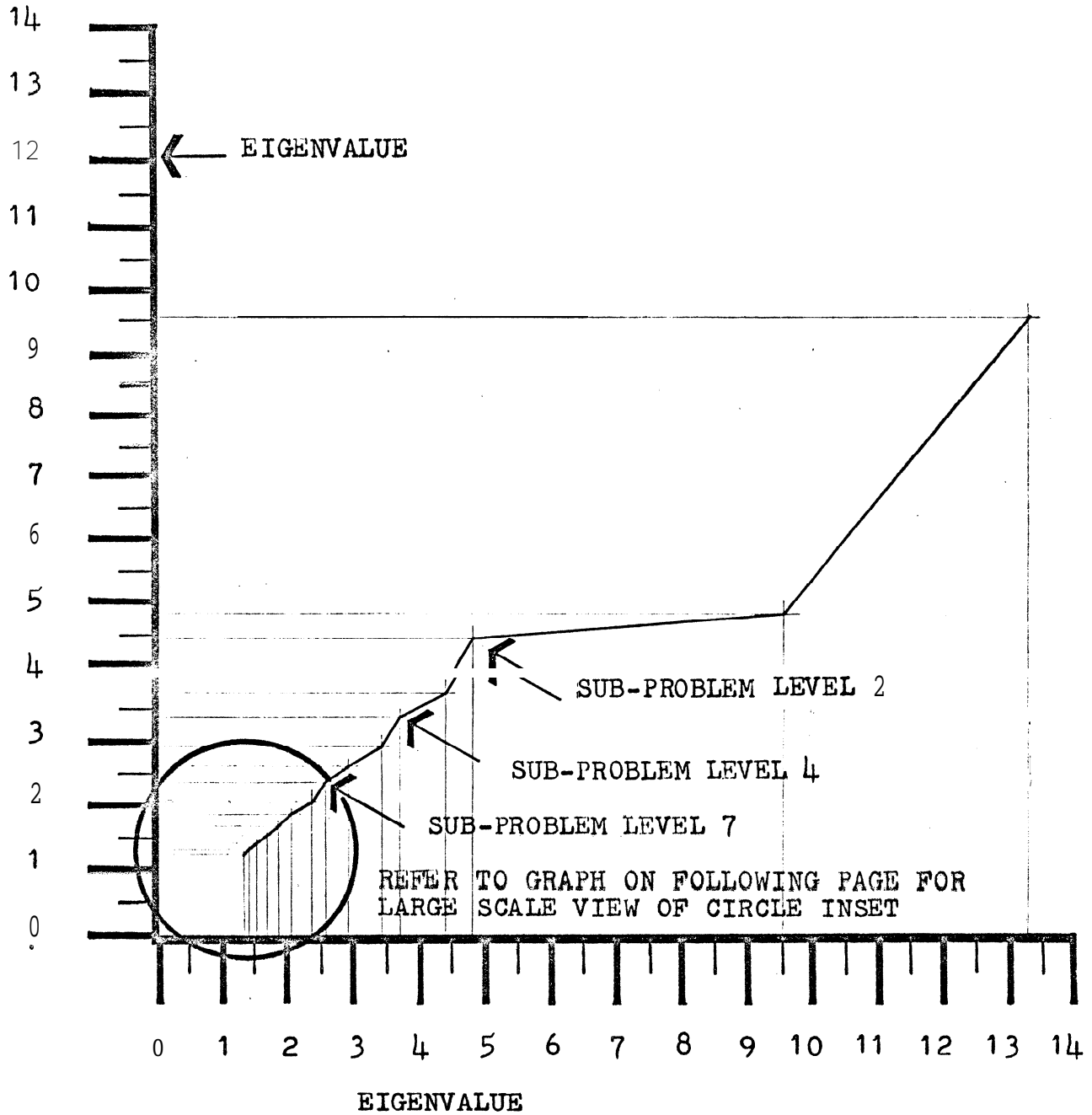
Section A - LIST OF 95 COMPONENTS

1. Protection against accidents and hazards
2. Protection against contagion
3. Provision for maintenance of cleanliness
4. Provision of adequate daylight, sunshine and ventilation
5. Protection against excessive noise
6. Protection against atmospheric pollution and offensive odors
7. Provision from fatigue
8. Provision of adequate privacy
9. Provision of opportunities for normal family and community life
10. Protection against moral hazards
11. Provisions of possibilities for reasonable aesthetic satisfaction
12. Nearness to land vehicular system
13. Nearness to water vehicular systems
14. Nearness of home to work
15. Nearness of work to recreation
16. Nearness of home to recreation
17. Nearness of home to shopping
18. Nearness of home to health facilities
19. Nearness of storage (warehouses) to office and retail areas
20. Nearness of retail. to industrial areas
21. Nearness of home to religious facilities
22. Nearness of home to social facilities
23. Nearness of home to school facilities
24. -Availability of sewerage
25. Availability of zoning protection
26. Proximity to same ethnic area
27. Proximity to blighted areas (poverty, disease)
28. Separation from blighted areas (poverty, disease)
29. Proximity to mixed uses
30. Provision of general residential amenities (upkeep, services)
31. Maximum economic income from the land (capital gain)
32. High assessed land value
33. Strong competitive "pull" of the area
34. Prospective investment in public improvements

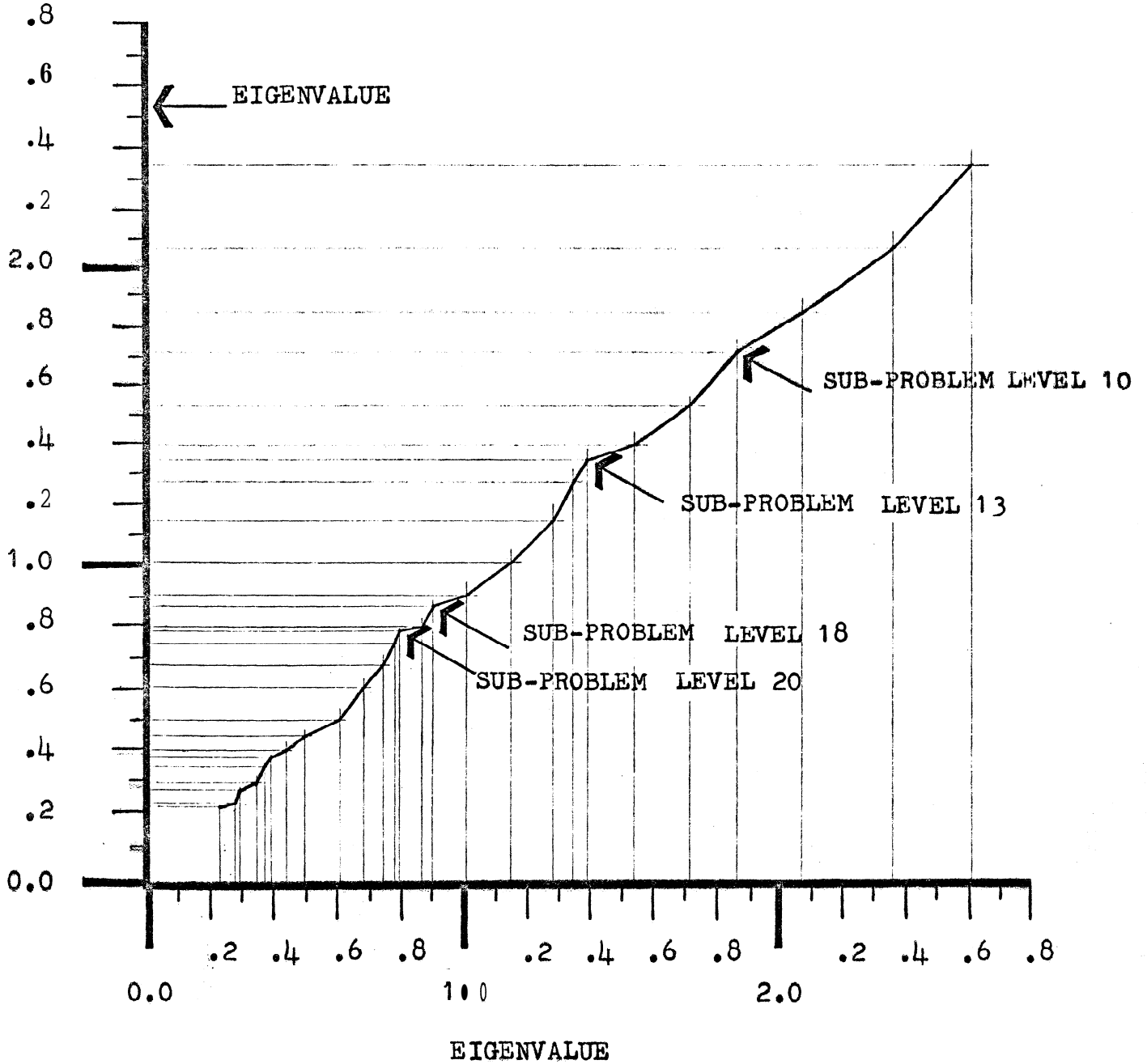
35. Nimum local property taxes
36. Minimum operating costs
37. Maximum interest on capital invested in present and future improvements
38. Maximum product sales potential at particular site
39. Minimum commuting expenses
40. Minimum improvement costs
41. Large supply of competitive settlement land
42. High intensity of land development
43. Good drainage characteristics of soil
44. Land not subject to flooding
45. Low turnover of occupancy
46. Increasing intensity of adjacent land use
47. Decreasing intensity of adjacent land use
48. Unpolluted ground water supply
49. Protective orientation with respect to prevailing winds
50. Utilization of natural pleasing features of landscape
51. Ease o'f marketability of land titles
52. Minimum anticipated risk in investments
53. Minimum interest on borrowed money
54. Maximum interest on loaned money
55. Convenient to streams of pedestrian traffic
56. Maximum knowledge of change of patterns of value through time
57. Maximum knowledge of use pattern change through time
58. Maximum knowledge of "whims" of land owners
59. Maximum knowledge of "whims" of land occupants
60. Minimum speculative subdivision of land
61. Minimum land vehicular traffic congestion
62. Diversification in industry
63. Variety and opportunity for choice in way of life
64. Freedom from ethnic conflict
65. Allowing "fringe" developments to occur
66. Children 0-16 of local families
67. Children 0-16 of non-local families
68. Native girls 16-21
69. Native boys 16-21
70. White girls 16-21
71. White boys 16-21
72. Unmarried native women (over 21)
73. Unmarried native men (over 21)
74. Unmarried permanent white women
75. Unmarried permanent white men
76. Unmarried transient white women
77. Unmarried transient white men
78. Local married native couples
79. Non-local married native couples
80. Married permanent white couples
81. Married transient white couples
82. Trades labor
83. Skilled labor

84. Unskilled labor
85. Managerial and professional employment
86. Self-employed as owner/manager
87. Self-employed as harvester of natural resources
88. Unemployment
89. Gainful employment in home
90. "Employment" as vocational student
91. Membership in educational clubs/associations
92. Membership in community and service clubs/associations
93. Membership in occupational clubs/associations
94. Membership in religious groups
95. Membership in recreational clubs/associations

EXAMPLE 1 - CHARACTERISTICS AND PEOPLE GROUPED BY
CHARACTERISTICS AND PEOPLE
Section B - GRAPH OF EIGENVALUES



EXAMPLE 1 a CHARACTERISTICS AND PEOPLE: GROUPED BY
 CHARACTERISTICS AND PEOPLE
 Section B - EIGENVALUES (CONT'D).



EXAMPLE 1

Section C - FACTOR BREAKDOWNSSUB-PROBLEM LEVEL TWO - (Two Facto-21 Solution)Factor One (F1) - Money, Trade and Efficiency

| | Factor Loading |
|--|-------------------|
| 33. Strong competitive "pull" of the area | .8 |
| 31. Maximum economic income from the land (capital gain) | .7 |
| 37. Maximum interest on capital invested in present and future improvements | .7 |
| 51. Ease of marketability of land titles | .7 |
| 52. Minimum anticipated risk in investments | .7 |
| 58. Maximum knowledge of "whims" of land owners | .7 |
| 85. Managerial and professional employment | .7 |
| 86. Self-employed as owner/manager | .7 |
| 32. High assessed land value | .6 |
| 34. Prospective investment in public improvements | .6 |
| 36. Minimum operating costs | .6 |
| 38. Maximum product sales potential at particular site | .6 |
| 40. Minimum improvement costs | .6 |
| 46. Increasing intensity of adjacent land use | .6 |
| 56. Maximum knowledge of change of patterns of value through time | .6 |
| 59. Maximum knowledge of "whims" of land occupants | .6 |
| 19. Nearness of storage (warehouses) to office and retail areas | .5 |
| 42. High intensity of land development | .5 |
| 43. Good drainage characteristics of soil | .5 |
| 44. Land not subject to flooding | .5 |
| 45. Low turnover of occupancy | .5 |
| 49. Protective orientation with respect to prevailing winds | .5 |
| 50. Utilization of natural pleasing features of landscape | .5 |
| 53. Minimum interest on borrowed money | .5 |
| 57. Maximum knowledge of use pattern change through time | .5 |
| 61. Minimum land vehicular traffic congestion | .5 |
| 93. Membership in occupational clubs/associations | .5 |
| 20. Nearness of retail to industrial areas | .4 |
| 24. Availability of sewerage | .4 |
| 30. Provision of general residential amenities (upkeep, services) | .4 |
| 39. Minimum commuting expenses | .4 |

| Factor Two (F2) - <u>Convenience and Protection</u> <u>- Youths and Children</u> | | Factor Loading |
|---|--|-------------------|
| 16. | Nearness of home to recreation | .7 |
| 21. | Nearness of home to religious facilities | .7 |
| 22. | Nearness of home to social facilities | .7 |
| 17. | Nearness of home to shopping | .6 |
| 18. | Nearness of home to health facilities | .6 |
| 23. | Nearness of home to school facilities | .6 |
| 70. | White girls 16-21 | .6 |
| 71. | White boys 16-21 | .6 |
| 95. | Membership in recreational clubs/associations | .6 |
| 2. | Protection against contagion | .5 |
| 3. | Provision for maintenance of cleanliness | .5 |
| 68. | Native girls 16-21 | .5 |
| 94. | Membership in religious groups | .5 |
| 4. | Provision of adequate daylight, sunshine and ventilation | .4 |
| 10. | Protection against moral hazards | .4 |
| 11. | Provisions of possibilities for reasonable aesthetic satisfaction | .4 |
| 14. | Nearness of home to work | .4 |
| 55. | Convenient to streams Of pedestrian traffic | .4 |
| 62. | Diversification in industry | .4 |
| 66. | Children 0-16 of local families | .4 |
| 69. | Native boys 16-21 | .4 |

SUB-PROBLEM LEVEL FOUR - (Four Factor Solution)

Factor One (F1) - Money, Trade and Efficiency

| | | |
|-----|--|----|
| 33. | Strong competitive "pull" of the area | .7 |
| 37. | Maximum interest on capital invested in present and future improvements | .7 |
| 52. | Minimum anticipated risk in Investments | .7 |
| 56. | Maximum knowledge of change of patterns of value through time | .7 |
| 58. | Maximum knowledge of "whims" of land owners | .7 |
| 85. | Managerial and professional employment | .7 |
| 86. | Self-employed as owner/manager | .7 |
| 31. | Maximum economic income from the land (capital gain) | .6 |
| 34. | Prospective investment in public improvements | .6 |
| 36. | Minimum operating costs | .6 |
| 38. | Maximum product sales potential at particular site | .6 |
| 40. | Minimum improvement costs | .6 |
| 43. | Good drainage characteristics of soil | .6 |

| | Factor Loading |
|---|-------------------|
| 44. Land not subject to flooding | .6 |
| 46. Increasing intensity of adjacent land use | .6 |
| 49. Protective orientation with respect to prevailing winds | .6 |
| 50. Utilization of natural pleasing features of landscape | .6 |
| 51. Ease of marketability of land titles | .6 |
| 53. Minimum interest on borrowed money | .6 |
| 57. Maximum knowledge of use pattern change through time | .6 |
| 59. Maximum knowledge of "whims" of land occupants | .6 |
| 19. Nearness of storage (warehouses) to office and retail areas | .5 |
| 24. Availability of sewerage | .5 |
| 32. High assessed land value | .5 |
| 42. High intensity of land development | .5 |
| 45. Low turnover of occupancy | .5 |
| 61 . Minimum land vehicular traffic congestion | .5 |
| 93. Membership in occupational clubs/associations | .5 |
| 30. Provision of general residential amenities (upkeep, services) | .4 |
| 35. Minimum local property taxes | .4 |
| 39. Minimum commuting expenses | .4 |

Factor Two (F2) - Convenience- Children, Youths,
Unmarried Natives

| | |
|---|----|
| 16. Nearness of home to recreation | .7 |
| 21. Nearness of home to religious facilities | .7 |
| 22. Nearness of home to social facilities | .7 |
| 17. Nearness of home to shopping | .6 |
| 23. Nearness of home to school facilities | .6 |
| 15. Nearness of work to recreation | .5 |
| 18. Nearness of home to health facilities | .5 |
| 66. Children 0-16 of local families | .5 |
| 67. Children 0-16 of non-local families | .5 |
| 69. Native boys 16-21 | .5 |
| 71. 'White boys 16-21 | .5 |
| 72. Unmarried native women (over 21) | .5 |
| 73. Unmarried native men (over 21) | .5 |
| 12. Nearness to land vehicular system | .4 |
| 13. Nearness to water vehicular systems | .4 |
| 14. Nearness of home to work | .4 |
| 55. Convenient to streams of pedestrian traffic | .4 |
| 68. Native girls 16-21 | .4 |
| 75. Unmarried permanent white men | .4 |

| Factor Three (F3) - <u>Protection and Labor</u> | Factor Loading |
|--|-------------------|
| 8. Provision of adequate privacy | .6 |
| 2. Protection against contagion | .5 |
| 4. Provision of adequate daylight, sunshine and ventilation | .5 |
| 10. Protection against moral hazards | .5 |
| 62. Diversification in industry | .5 |
| 83. Skilled labor | .5 |
| 84. Unskilled labor | .5 |
| 94. Membership in religious groups | .5 |
| 3. Provision for maintenance of cleanliness | .4 |
| 24. Availability of sewerage | .4 |
| 48. Unpolluted ground water supply | .4 |

Factor Four (F4) - Health- White Adults

| | |
|--|----|
| 6. Protection against atmospheric pollution and offensive odors | .6 |
| 11. Provisions of possibilities for reasonable aesthetic satisfaction | .6 |
| 2. Protection against contagion | .5 |
| 3. Provision for maintenance of cleanliness | .5 |
| 74. Unmarried permanent white women | .5 |
| 76. Unmarried transient white women | .5 |
| 81. Married transient white couples | .5 |
| 80. Married permanent white couples | .4 |

SUB-PROBLEM LEVEL SEVEN - (Seven Factor Solution)

Factor One (F1) - Money, Trade and Efficiency

| | |
|--|----|
| 31. Maximum economic income from the land (capital gain) | .7 |
| 33. Strong competitive "pull" of the area | .7 |
| 37. Maximum interest on capital invested in present and future improvements | .7 |
| 51. Ease of marketability of land titles | .7 |
| 52. Minimum anticipated risk in investments | .7 |
| 56. Maximum knowledge of change of patterns of value through time | .7 |
| 58. Maximum knowledge of "whims" of land owners | .7 |

| | Factor Loading |
|---|-------------------|
| 59. Maximum knowledge of "whims" of land occupants | .7 |
| 86. Self-employed as owner/manager | .7 |
| 32. High assessed land value | .6 |
| 36. Minimum operating costs | .6 |
| 38. Maximum product sales potential at particular site | .6 |
| 57. Maximum knowledge of use pattern change through time | .6 |
| 85. Managerial and professional employment | .6 |
| 19. Nearness of storage (warehouses) to office and retail areas | .5 |
| 20. Nearness of retail to industrial areas | .5 |
| 34. Prospective investment in public improvements | .5 |
| 45. Low turnover of occupancy | .5 |
| 46. Increasing intensity of adjacent land use | .5 |
| 61. Minimum land vehicular traffic congestion | .5 |
| 93. Membership in occupational clubs/associations | .5 |
| 25. Availability of zoning protection | .4 |

Factor Two (F2) - Convenience

| | |
|---|----|
| 16. Nearness of home to recreation | .7 |
| 21. Nearness of home to religious facilities | .7 |
| 22. Nearness of home to social facilities | .7 |
| 12. Nearness to land vehicular system | .6 |
| 17. Nearness of home to shopping | .6 |
| 23. Nearness of home to school facilities | .6 |
| 55. Convenient to streams of pedestrian traffic | .6 |
| 14. Nearness of home to work | .5 |
| 15. Nearness of work to recreation | .5 |
| 29. Proximity to mixed uses | .5 |
| 39. Minimum commuting expenses | .5 |
| 42. High intensity of land development | .5 |
| 95. Membership in recreational clubs/associations | .5 |
| 94. Membership in religious groups | .4 |

Factor Three (F3) - "Unsettled" Native Peoples

| | |
|--------------------------------------|----|
| 69. Native boys 16-21 | .6 |
| 73. Unmarried native men (over 21) | .6 |
| 79. Non-local married native couples | .6 |
| 88. Unemployment | .6 |

| | Factor Loading |
|---|-------------------|
| 65. Allowing "fringe" developments to occur | .5 |
| 68. Native girls 16-21 | .5 |
| 72. Unmarried native women (over 21) | .5 |
| 13. Nearness to water vehicular systems | .4 |
| 62. Diversification in industry | .4 |
| 64. Freedom from ethnic conflict | .4 |

Factor Four (F4) - Health- White Adults

| | |
|---|----|
| 2. Protection against contagion | .7 |
| 6. Protection against atmospheric pollution and offensive odors | .7 |
| 1. Protection against accidents and hazards | .6 |
| 3. Provision for maintenance of cleanliness | .6 |
| 11. Provisions of possibilities for reasonable aesthetic satisfaction | .6 |
| 80. Married permanent white couples | .5 |
| 4. Provision of adequate daylight, sunshine and ventilation | .4 |

Factor Five (F5) - Health- white Youths and Unmarried Whites

| | | |
|--|----|--|
| 4 | | |
| 78. Unmarried permanent white women | .7 | |
| 1. Nearness of home to health facilities | .6 | |
| 70. White girls 16-21 | .6 | |
| 71. White boys 16-21 | .6 | |
| 67. Children 0-16 of local families | .5 | |
| 67. Children 0-16 of non-local families | .5 | |
| 75. Unmarried permanent white men | .5 | |
| 68. Native married 16-21 white women | .5 | |
| girls | .4 | |

Factor Six (F6) - Land Characteristics

| | |
|---|----|
| 43. Good drainage characteristics of soil | .7 |
| 44. Land not subject to flooding | .7 |
| 48. Unpolluted ground water supply | .7 |

| | Factor Loading |
|---|-------------------|
| 49. Protective orientation with respect to prevailing winds | .7 |
| 24. Availability of sewerage | .6 |
| 40. Minimum improvement costs | .6 |
| 50. Utilization of natural pleasing features of landscape | .5 |
| 53. Minimum interest on borrowed money | .5 |
| 55. Convenient to streams of pedestrian traffic | .4 |

Factor Seven (F7)- Labor and Privacy

| | |
|---|----|
| 83. Skilled labor | .6 |
| 8. Provision of adequate privacy | .5 |
| 82. Trades labor | .5 |
| 5. Protection against excessive noise | .4 |
| 10. Protection against moral hazards | .4 |
| 47. Decreasing intensity of adjacent land use | .4 |

SUB-PROBLEM LEVEL TEN - (Ten Factor Solution)

Factor One (F1)- Money, Trade and Efficiency

| | |
|---|----|
| 31. Maximum economic income from the land (capital gain) | .8 |
| 33. Strong competitive "pull" of the area | .8 |
| 32. High assessed land value | .7 |
| 36. Minimum operating costs | .7 |
| 38. Maximum product sales potential at particular site | .7 |
| 51. Ease of marketability of land titles | .7 |
| 85. Managerial and professional employment | .7 |
| 86. Self-employed as owner/manager | .7 |
| 34. Prospective investment in public improvements | .6 |
| 37. Maximum interest on capital invested in present and future improvements | .6 |
| 52. Minimum anticipated risk in investments | .6 |
| 30. Provision of general residential amenities | .5 |
| 42. High intensity of land development | .5 |
| 46. Increasing intensity of adjacent land use | .5 |
| 19. Nearness of storage (warehouses) to office and retail areas | .4 |
| 39. Minimum commuting expenses | .4 |

| | Factor Loading |
|---|-------------------|
| 58. Minimum improvement costs | .4 |
| . Maximum knowledge of "whims" of land owners | .4 |

Factor Two (F2) - Convenience

| | |
|---|----|
| 21. Nearness of home to religious facilities | .8 |
| 22. Nearness of home to social facilities | .7 |
| 23. Nearness of home to school facilities | .7 |
| 16. Nearness of home to recreation | .6 |
| 17. Nearness of home to shopping | .6 |
| 94. Membership in religious groups | .6 |
| 95. Membership in recreational clubs/associations | .6 |
| 10. Protection against moral hazards | .5 |
| 14. Nearness of home to work | .4 |

Factor Three (F3) - Health and Safety- White Adults

| | |
|---|----|
| 1. Protection against accidents and hazards | .7 |
| 2. Protection against contagion | .7 |
| 6. Protection against atmospheric pollution and offensive odors | .7 |
| 3. Provision for maintenance of cleanliness | .6 |
| 11. Provisions of possibilities for reasonable aesthetic satisfaction | .6 |
| 4. Provision of adequate daylight, sunshine and ventilation | .5 |
| 80. Married permanent white couples | .5 |

Factor Four (F4) - "Unsettled" Native Peoples

| | |
|---|----|
| 65. Allowing "fringe" developments to occur | .6 |
| 69. Native boys 16-21 | .6 |
| 73. Unmarried native men (over 21) | .6 |
| 88. Unemployment | .6 |
| 62. Diversification in industry | .5 |
| 79. Non-local married native couples | .5 |
| 84a Unskilled labor | .5 |
| 68. Native girls 16-21 | .4 |

| | Factor Loading |
|--------------------------------------|-------------------|
| 72. Unmarried native women (over 21) | .4 |

Factor Five (F5) - Children, Youths and Unmarried
(White and Native)

| | |
|---|----|
| 66. Children 0-16 of local families | .8 |
| 67. Children 0-16 of non-local families | .8 |
| 70. White girls 16-21 | .6 |
| 74. Unmarried permanent white women | .6 |
| 68. -Native girls 16-21 | .5 |
| 71. White boys 16-21 | .5 |
| 72. Unmarried native women (over 21) | .5 |
| 75. Unmarried permanent white men | .4 |

Factor Six (F6) - Land Characteristics

| | |
|---|----|
| 43. Good drainage characteristics of soil | .9 |
| 44. Land not subject to flooding | .9 |
| 49. Protective orientation with respect to prevailing winds | .8 |
| 48. Unpolluted ground water supply | .7 |
| 24. Availability of sewerage | .6 |
| 40. Minimum improvement costs | .6 |
| 53. Minimum interest on borrowed money | .5 |
| 50. Utilization of natural pleasing features of landscape | .4 |

Factor Seven (F7) - Intensity of Activities

| | |
|---|----|
| 29. Proximity to mixed uses | .6 |
| 55. Convenient to streams of pedestrian traffic | .6 |
| 12. Nearness to land vehicular system | .5 |
| 42. High intensity of land development | .5 |
| 46. Increasing intensity of adjacent land use | .5 |

Factor Eight (F8) - Convenience

| | Factor Loading |
|--|-------------------|
| 20. Nearness of retail to industrial areas. | .7 |
| 15 ^a Nearness of work to recreation | .6 |
| 19. Nearness of storage (warehouses) to office and retail areas | .6 |
| 14. Nearness of home to work | .5 |
| 17. Nearness of home to shopping | .5 |
| 18. Nearness of home to health facilities | .5 |
| 76. Unmarried transient white women | .4 |

Factor Nine (F9)- Knowledge of Present and Future
Patterns

| | |
|--|----|
| 56. Maximum knowledge of change of patterns of value through time | .8 |
| 57. Maximum knowledge of use pattern change through time | .8 |
| 59. Maximum knowledge of "whims" of land occupants | .8 |
| 58. Maximum knowledge of "whims" of land owners | .7 |
| 61. Minimum land vehicular traffic congestion | .4 |

Factor Ten (F10) - Labor

| | |
|---------------------|----|
| 82. Trades labor | .7 |
| 83. Skilled labor | .7 |
| 84. Unskilled labor | .5 |

SUB-PROBLEM LEVEL THIRTEEN - (Thirteen Factor Solution)Factor One (F1) - Money, Trade and Efficiency

| | |
|---|----|
| 31. Maximum economic income from the land (capital gain) | .8 |
| 33. Strong competitive "pull" of the area | .8 |
| 32. High assessed land value | .7 |
| 36. Minimum operating costs | .7 |
| 38. Maximum product sales potential at particular site | .7 |
| 51. Ease of marketability of land titles | .7 |

Factor Four (F4) - "Unsettled" Native PeoplesFactor
Loading

| | | |
|-----|---|----|
| 88. | Unemployment | .7 |
| 62. | Diversification in industry | .6 |
| 84. | Unskilled labor | .6 |
| 65. | Allowing "fringe" developments to occur | .5 |
| 69. | Native boys 16-21 | .5 |
| 73. | Unmarried native men (over 21) | .5 |
| 87. | Self-employed as harvester of natural resources | .5 |
| 13. | Nearness to water vehicular systems | .4 |
| 72. | Unmarried native women (over 21) | .4 |

Factor Five (F5) - Children

| | | |
|-----|--|----|
| 66. | Children 0-16 of local families | .9 |
| 67. | Children 0-16 of non-local families | .9 |

Factor Six (F6) - Land Characteristics

| | | |
|-----|---|----|
| 43. | Good drainage characteristics of soil | .9 |
| 44. | Land not subject to flooding | .9 |
| 49. | Protective orientation with respect to prevailing winds | .8 |
| 48. | Unpolluted ground water supply | .7 |
| 24. | Availability of sewerage | .6 |
| 40. | Minimum improvement costs | .5 |
| 53. | Minimum interest on borrowed money | .5 |
| 50. | Utilization of natural pleasing features of landscape | .4 |

Factor Seven (F7) - Retail and Industrial Convenience

| | | |
|-----|---|----|
| 20. | Nearness of retail to industrial areas | .7 |
| 19. | Nearness of storage (warehouses) to office and retail areas | .6 |

Factor Eight (F8) - Intensivity of ActivitiesFactor
Loading

| | | |
|-----|---|----|
| 29. | Proximity to mixed uses | .7 |
| 42. | Nearness to land vehicular system | .5 |
| 42. | High intensity of land development | .5 |
| 46. | Increasing intensity of land use | .5 |
| 55. | Convenient to streams of pedestrian traffic | .4 |

Factor Nine (F9) - Knowledge of Present and Future Patterns

| | | |
|-----|---|----|
| 56. | Maximum knowledge of change of patterns of value through time | .8 |
| 57. | Maximum knowledge of use pattern change through time | .8 |
| 59. | Maximum knowledge of "whims" of land occupants | .8 |
| 58. | Maximum knowledge of "whims" of land owners | .7 |

Factor Ten (F10) - Labor and Youth

| | | |
|-----|-------------------------|----|
| 70. | White girls 16-21 | .7 |
| 71. | -White 16-21 | .7 |
| 82. | Native labor boys 16-21 | .6 |
| 83. | Skilled labor | .4 |

Factor Eleven (F11) - Total Community Spirit

| | | |
|-----|---|----|
| 64. | Freedom from ethnic conflict | .6 |
| 35. | Minimum local property taxes | .5 |
| 93. | Membership in occupational clubs/associations | .4 |

Factor Twelve (F12) - Permanent Married Couples

| | | |
|-----|------------------------------|----|
| 78. | Local married native couples | .7 |
|-----|------------------------------|----|

| | Factor Loadings |
|---|--------------------|
| 80. Married permanent white couples | .6 |
| 13. Nearness to water vehicular systems | .4 |

Factor Thirteen (F13) - Separate From Blighted Areas

| | |
|---|----|
| 28. Separation from blighted areas (poverty, disease) | .7 |
| 83. Availability of sewerage | .4 |
| 83. Skilled labor | .4 |

SUB-PROBLEM LEVEL EIGHTEEN - (Eighteen Factor Solution)

Factor One (F1) - Money, Trade and Efficiency

| | |
|--|----|
| 31. Maximum economic income from the land (capital gain) | .8 |
| 33. Strong competitive "pull" of the area | .8 |
| 36. Minimum operating costs | .8 |
| 32. High assessed land value | .7 |
| 37. Maximum interest on capital invested on present and future improvements | .7 |
| 38. Maximum product sales potential at particular site | .7 |
| 34. Prospective investment in public improvements | .6 |
| 46. Increasing intensity of adjacent land use | .6 |
| 51. Ease of marketability of land titles | .6 |
| 52. Minimum anticipated risk in investments | .6 |
| 85. Managerial and professional employment | .6 |
| 86. Self-employed as owner/manager | .6 |
| 42. High intensity of land development | .5 |
| 19. Nearness of storage (warehouses) to office and retail areas | .4 |
| 40. Minimum improvement costs | .4 |

Factor Two (F2) - Convenience

| | |
|--|----|
| 16. Nearness of home to recreation | .8 |
| 17. Nearness of home to shopping | .8 |
| 21. Nearness of home to religious facilities | .8 |

| | Factor Loading |
|---|-------------------|
| 23. Nearness of home to school facilities | .8 |
| 22. Nearness of home to social facilities | .7 |
| 18. Nearness of home to health facilities | .6 |
| 14. Nearness of home to work | .5 |
| 15. Nearness of-work to recreation | .5 |
| 94. Membership in religious groups | .5 |
| 95. Membership in recreational clubs/associations | .5 |
| 10. Protection against moral hazards | .4 |

Factor Three (F3) - Health and Safety

| | |
|---|----|
| 2. Protection against contagion | .8 |
| 1. Protection against accidents and hazards | .7 |
| 3. Provision for maintenance of cleanliness | .7 |
| 6. Protection against atmospheric pollution and offensive odors | .7 |
| 4. Provision of adequate daylight, sunshine and ventilation | .5 |
| 11. Provisions of possibilities for reasonable aesthetic satisfaction | .5 |

Factor Four (F4) - Land Characteristics

| | |
|---|----|
| 43. Good drainage characteristics of soil | .9 |
| 44. Land not subject to flooding | .9 |
| 49. Protective orientation with respect to prevailing winds | .8 |
| 48. Unpolluted ground water supply | .7 |
| 24. Availability of sewerage | .6 |
| 40. Minimum improvement costs | .5 |
| 53. Minimum interest on borrowed money | .5 |
| 50. Utilization of natural pleasing features of Landscape | .4 |

| Factor Five (F5) - <u>Native Youths, Unmarried and Couples</u> | | Factor Loading |
|--|-------------------------------------|-------------------|
| 72. | Unmarried native women (over 21) | .7 |
| 73. | Unmarried native men (over 21) | .7 |
| 69. | Native boys 16-21 | .6 |
| 68. | Native girls 16-21 | .5 |
| 78. | Local married native couples | .5 |
| 79. | Non-local married native couples | .5 |
| 88. | Unemployment | .5 |
| 13. | Nearness to water vehicular systems | .4 |

Factor Six (F6) - White Adults

| | | |
|-----|---------------------------------|----|
| 74. | Unmarried permanent white women | .7 |
| 81 | Married transient white couples | .7 |
| 75a | Unmarried permanent white men | .5 |
| 76. | Unmarried transient white women | .5 |
| 80. | Married permanent white couples | .5 |

Factor Seven (F7) - Knowledge of Present and
Future Patterns

| | | |
|-----|---|----|
| 56. | Maximum knowledge of change of patterns of value through time | .8 |
| 57. | Maximum knowledge of use pattern change through time | .8 |
| 59. | Maximum knowledge of "whims" of land occupants | .7 |
| 58. | Maximum knowledge of "whims" of land owners | .7 |

Factor Eight (F8) - Labor

| | | |
|-----|-----------------|----|
| 82. | Trades labor | .8 |
| 83. | Skilled labor | .8 |
| 84. | Unskilled labor | .7 |

Factor Nine (F9) - Intensity of Activities

| | Factor Loading |
|---|-------------------|
| 29. Proximity to mixed uses | .7 |
| 12. Nearness to land vehicular system | .6 |
| 46. Increasing intensity of adjacent land use | .5 |
| 55. Convenient to streams of pedestrian traffic | .5 |
| 42. High intensity of land development | .4 |

Factor Ten (F10) - Unmarried Transient White Men

| | |
|-----------------------------------|----|
| 77. Unmarried transient white men | .6 |
|-----------------------------------|----|

Factor Eleven (F11)- Total Community Spirit

| | |
|----------------------------------|----|
| 64. Freedom from ethnic conflict | .6 |
|----------------------------------|----|

Factor Twelve (F12) - Children

| | |
|--|----|
| 66. Children 0-16 of local families | .9 |
| 67. Children 0-16 of non-local families | .9 |

Factor Thirteen (F13)- Separated From Blighted Areas

| | |
|---|----|
| 28. Separation from blighted areas (poverty, disease) | .7 |
| 40. Minimum improvement costs | .4 |

Factor Fourteen (F14) - Retail and Industrial Convenience

| | |
|--|----|
| 19. Nearness of storage (warehouses) to office and retail areas | .7 |
| 20. Nearness of retail to industrial areas | .7 |

Factor Fifteen (F15) - Owner, Manager, Professional Factor Loading

- | | |
|--|----|
| 85. Managerial and professional employment | .5 |
| 86. Self-employed as owner/manager | .5 |

Factor Sixteen (F16) - Youths

- | | |
|-----------------------|----|
| 70. White girls 16-21 | .6 |
| 71. White boys 16-21 | .6 |

Factor Seventeen (F17) - Vocational Student

- | | |
|--|----|
| 90. "Employment" as vocational student | .2 |
| 5. Protection against excessive noise | .4 |
| 62. Diversification in industry | .4 |

Factor Eighteen (F18) - Variety and Travelling Expenses

- | | |
|---|----|
| 63. Variety and opportunity for choice in way of life | .6 |
| 39. Minimum commuting expenses | .5 |

SUB-PROBLEM LEVEL TWENTY - (Twenty Factor Solution)

Factor One (F1) - Money, Trade, and Efficiency

- | | |
|--|----|
| 31. Maximum economic income from the land (capital gain) | .8 |
| 33. Strong competitive "pull" of the area | .8 |
| 36. Minimum operating costs | .8 |
| 32. High assessed land value | .7 |
| 37. Maximum interest on capital invested in present and future improvements | .7 |
| 38. Maximum product sales potential at particular site | .7 |
| 34. Prospective investment in public improvements | .6 |

Factor Four (F4) - Land Characteristics

| | Factor Loading |
|---|-------------------|
| 43. Good drainage characteristics of soil | .9 |
| 44. Land not subject to flooding | .9 |
| 49. Protective orientation with respect to prevailing winds | .8 |
| 48. Unpolluted ground water supply | .7 |
| 24. Availability of sewerage | .6 |
| 40. Minimum improvement costs | .5 |
| 50. Utilization of natural pleasing features of landscape | .4 |
| 53. Minimum interest on borrowed money | .4 |

Factor Five (F5) - Native Youths, Unmarried and Couples

| | |
|--------------------------------------|----|
| 72. Unmarried native women (over 21) | .7 |
| 73. Unmarried native men (over 21) | .7 |
| 68. Native girls 16-21 | .6 |
| 69. Native boys 16-21 | .6 |
| 79. Non-local married native couples | .5 |
| 88. Local married native couples | .4 |
| Unemployment | .4 |

Factor Six (F6) - White Adults

| | |
|-------------------------------------|----|
| 81. Married transient white couples | .7 |
| 76. Unmarried transient white women | .6 |
| 74. Unmarried permanent white women | .6 |

Factor Seven (F7) - Vocational Student

| | |
|--|----|
| 90. "Employment" as vocational student | .5 |
|--|----|

Factor Eight (F8)- Labor

| | Factor Loading |
|---------------------|-------------------|
| a2. Trades labor | .8 |
| 83. Skilled labor | .8 |
| 84. Unskilled labor | .7 |

Factor Nine (F9)- Intensitivy of Activities

| | |
|---|----|
| 29. Proximity to mixed uses | .7 |
| 12. Nearness to land vehicular system | .5 |
| 42. High intensity of land development | .4 |
| 46. Increasing intensity of adjacent land use | .4 |
| 55. Convenient to streams of pedestrian traffic | .4 |

Factor Ten (F10) - Retail and Industrial Convenience

| | |
|--|----|
| 19. Nearness of storage (warehouses) to office and retail areas | .7 |
| 20a. Nearness of retail to industrial areas | .7 |

Factor Eleven (F11)- Travelling Expenses

| | |
|--------------------------------|----|
| 39. Minimum commuting expenses | .5 |
|--------------------------------|----|

Factor Twelve (F12) - Children

| | |
|---|----|
| 66. Children 0-16 of local families | .9 |
| 67. Children 0-16 of non-local families | .9 |

Factor Thirteen (F13) - Land Oriented PeoplesFactor
Loading

| | | |
|-----|---|----|
| 97. | Self-employed as harvester of natural resources | .5 |
| 88. | Unemployment | .5 |

Factor Fourteen (F14) - Separation From Blighted Areas

| | | |
|-----|---|----|
| 28. | Separation from blighted areas (poverty, disease) | .7 |
|-----|---|----|

Factor Fifteen (F15) - No Fatigue

| | | |
|----|------------------------|----|
| 7. | Provision from fatigue | .6 |
|----|------------------------|----|

Factor Sixteen (F16) Unmarried Transient White Men

| | | |
|-----|-------------------------------|----|
| 77. | Unmarried transient white men | .6 |
|-----|-------------------------------|----|

Factor Seventeen (F17) - Knowledge of Present and Future Patterns

| | | |
|-----|---|----|
| 56. | Maximum knowledge of change of patterns of value through time | .8 |
| 57. | Maximum knowledge of use pattern change through time | .8 |
| 59. | Maximum knowledge of "whims" of land occupants | .8 |
| 58. | Maximum knowledge of "whims" of land owners | .7 |

Factor Eighteen (F18) - Community Spirit

| | | |
|-----|---|----|
| 60. | Minimum speculative subdivision of land | .6 |
| 64. | Freedom from ethnic conflict | .4 |

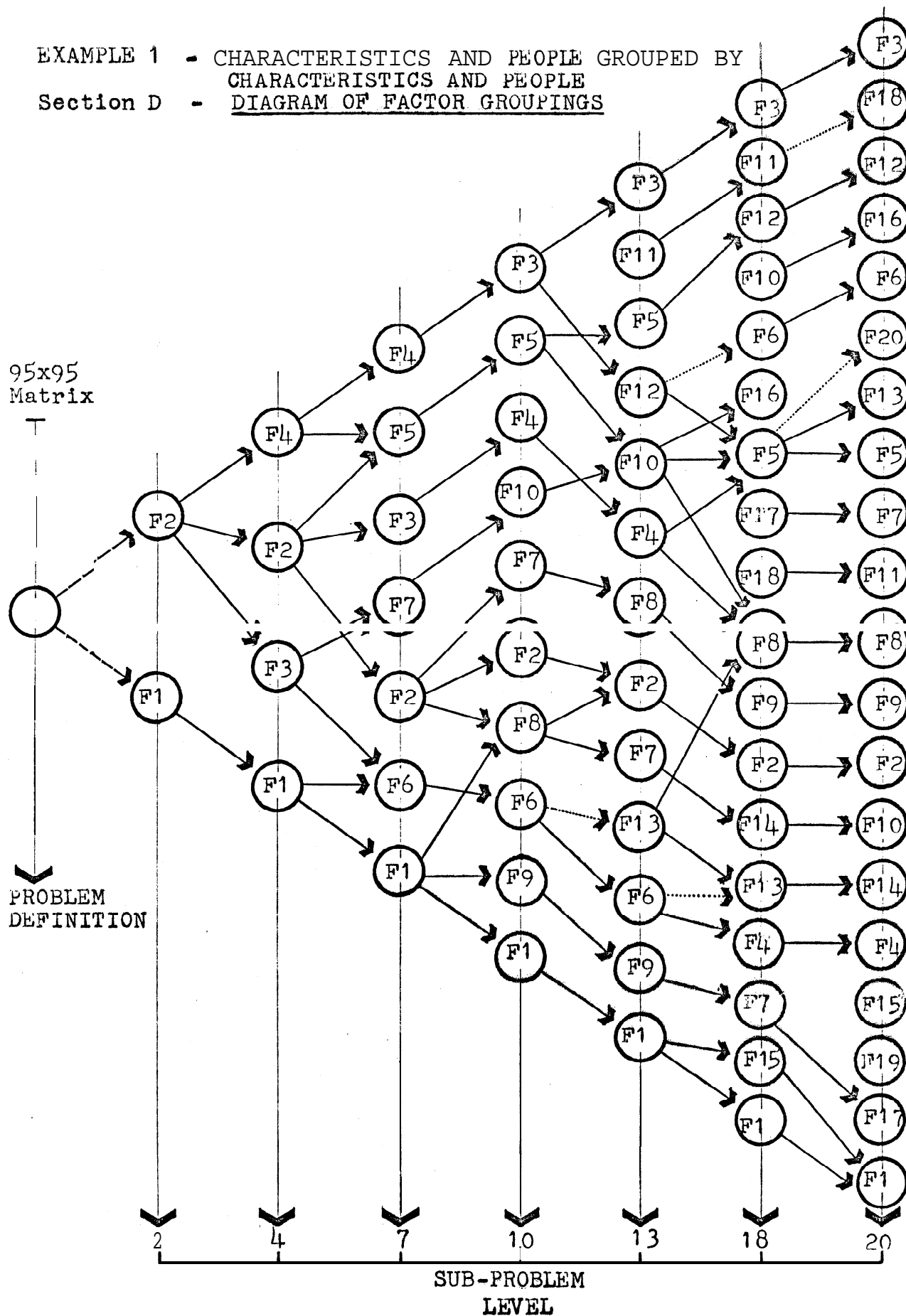
Factor Nineteen (F19) - Ethnic Interaction

| | Factor Loading |
|--|-------------------|
| 26. Proximity to same ethnic area | .5 |
| 92. Membership in community and service clubs/ associations | .5 |

Factor Twenty (F20) - Local Couples' way of Life

| | |
|---|----|
| 63. Variety and opportunity for choice in way of life | .6 |
| 78. Local married native couples | .5 |
| 80. Married permanent white couples | .5 |

EXAMPLE 1 - CHARACTERISTICS AND PEOPLE GROUPED BY CHARACTERISTICS AND PEOPLE
 Section D - DIAGRAM OF FACTOR GROUPINGS



APPENDIX TWO

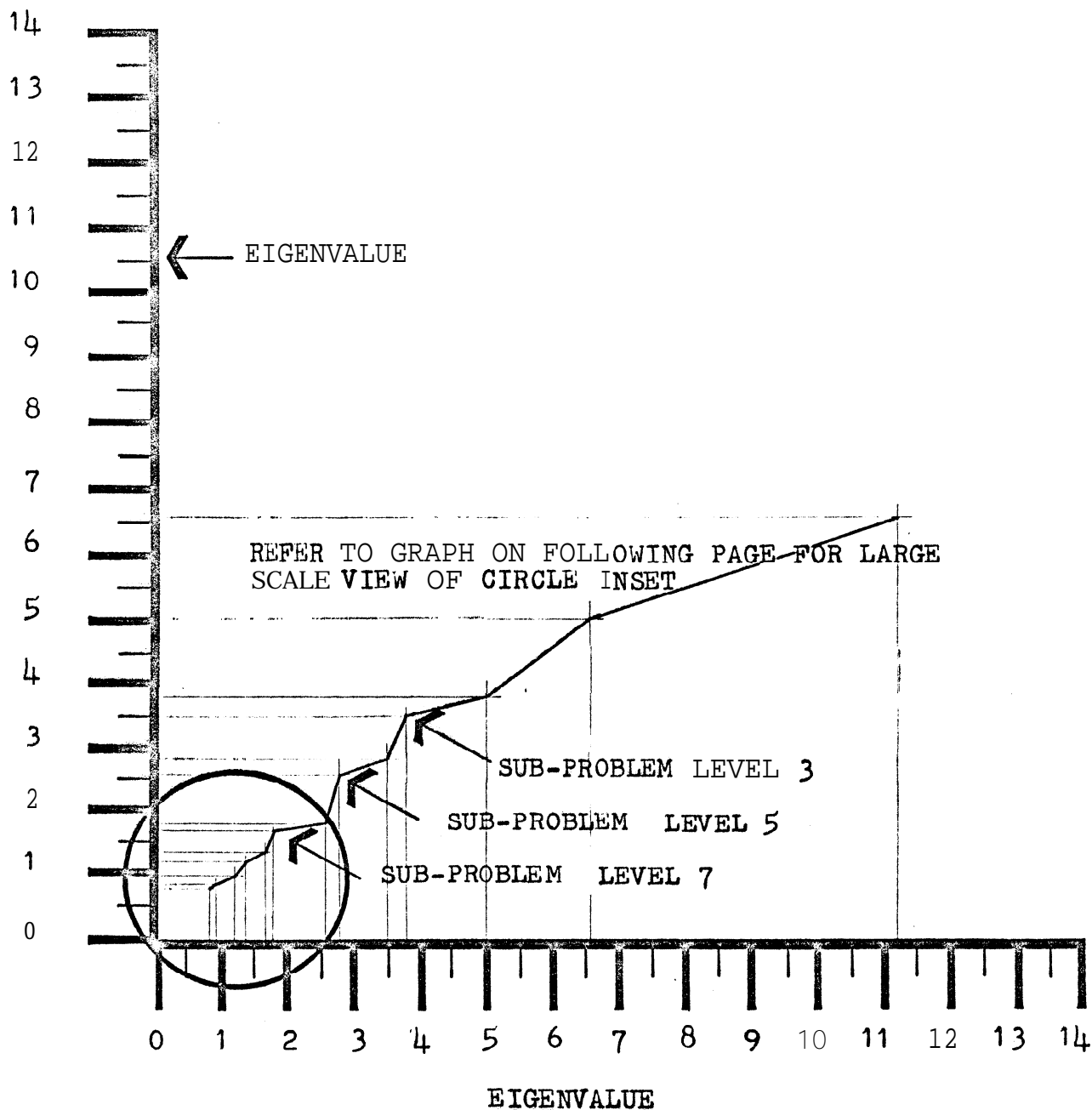
EXAMPLE 2 - CHARACTERISTICS GROUPED BY CHARACTERISTICSSection A - LIST OF 68 COMPONENTS

1. Protection against accidents and hazards
2. Protection against contagion
3. Provision for maintenance of cleanliness
4. Provision of adequate daylight, sunshine and ventilation
5. Protection against excessive noise
6. Protection against atmospheric pollution and offensive odors
7. Provision from fatigue
8. Provision of adequate privacy
9. Provision of opportunities for normal family and community life
10. Protection against moral hazards
11. Provision of possibilities for reasonable aesthetic satisfaction
12. Nearness to land vehicular system
13. Nearness to water vehicular systems
14. Nearness of home to work
15. Nearness of work to recreation
16. Nearness of home to recreation
17. Nearness of home to shopping
18. Nearness of home to health facilities
19. Nearness of storage (warehouses) to office and retail areas
- 20.** Nearness of retail to industrial areas
- 21.** Nearness of home to religious facilities
- 22.** Nearness of home to social facilities
23. Nearness of home to school facilities
24. Availability of sewerage
25. Availability of zoning protection
26. Proximity to same ethnic area
27. Proximity to blighted areas (poverty, disease)
28. Separation from blighted areas (poverty, disease)
29. Proximity to mixed uses
30. Provision of general residential amenities (upkeep, services)
31. Maximum economic income from the land (capital gain)
32. High assessed land value
33. Strong competitive "pull" of the area

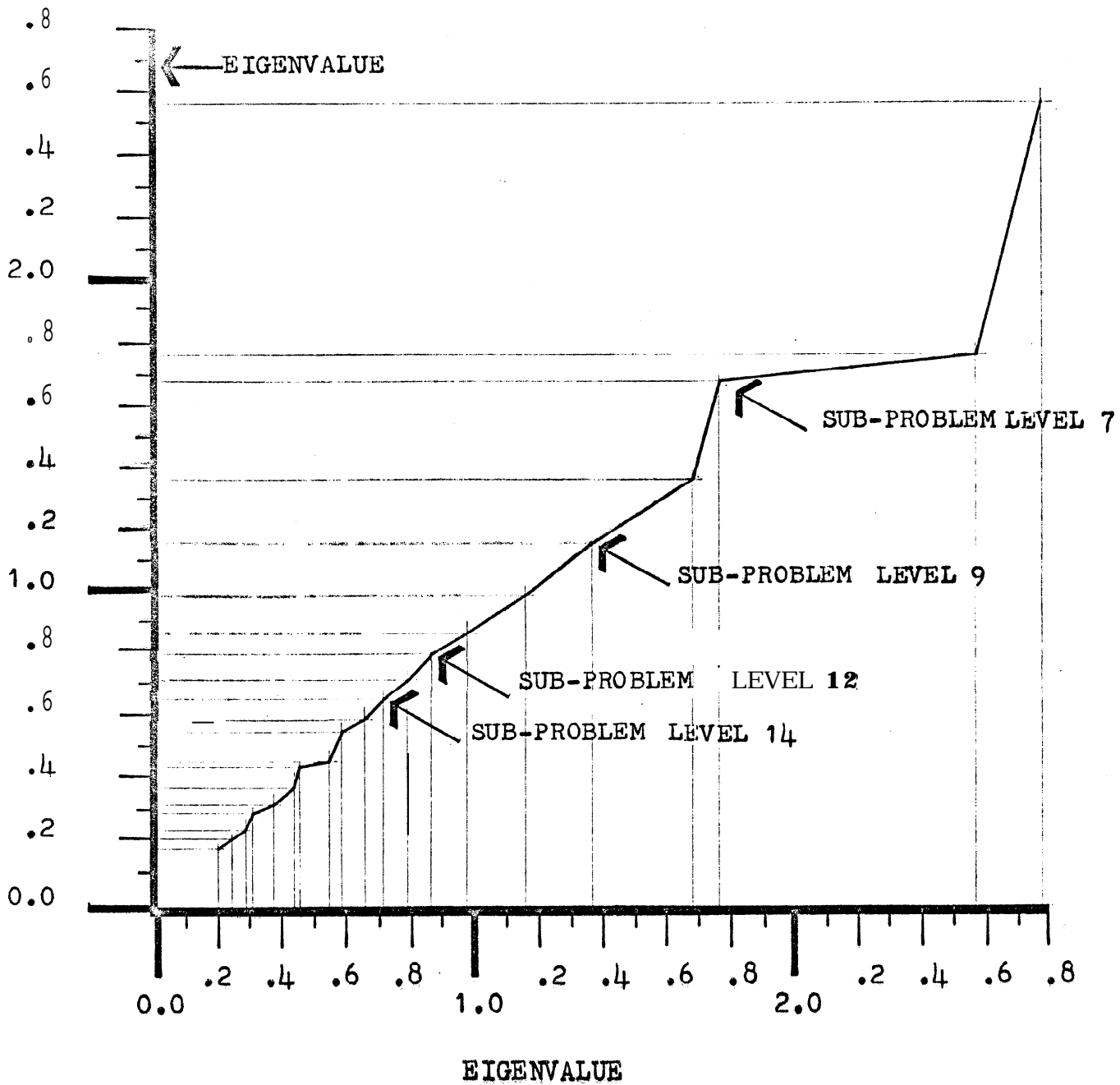
34. Prospective investment in public improvements
35. Minimum local property taxes
36. Minimum operating costs
37. Maximum interest on capital invested in present and future improvements
38. Maximum product sales potential at particular site
39. Minimum commuting expenses
40. Minimum improvement costs
41. Large supply of competitive settlement land
42. High intensity of land development
43. Terrain slope of 0 degrees
44. Terrain slope of 0-15 degrees
45. Terrain slope of 15+ degrees
46. Good drainage characteristics of soil
47. Land not subject to flooding
48. Low turnover of occupancy
49. Increasing intensity of adjacent land use
50. Decreasing intensity of adjacent land use
51. Unpolluted ground water supply
52. Protective orientation with respect to prevailing winds
53. Utilization of natural pleasing features of landscape
54. Ease of marketability of land titles
55. Minimum anticipated risk in investments
56. Minimum interest on borrowed money
57. Maximum interest on loaned money
58. Convenient to streams of pedestrian traffic
59. Maximum knowledge of change of patterns of value through time
60. Maximum knowledge of use pattern change through time
61. Maximum knowledge of "whims" of land owners
62. Maximum knowledge of "whims" of land occupants
63. Minimum speculative subdivision of land
64. Minimum land vehicular traffic congestion
65. Diversification in industry
66. Variety and opportunity for choice in way of life
67. Freedom from ethnic conflict
68. Allowing "fringe" developments to occur

EXAMPLE 2 - CHARACTERISTICS GROUPED BY CHARACTERISTICS

Section B - GRAPH OF EIGENVALUES



EXAMPLE 2 - CHARACTERISTICS GROUPED BY CHARACTERISTICS

Section B - EIGENVALUES (CONT'D)

EXAMPLE 2

Section C - FACTOR BREAKDOWNSSUB-PROBLEM LEVEL TWO-(Two factor Solution)Factor One (F1) - Money, Trade and Efficiency

| | Factor Loading |
|--|-------------------|
| 33. Strong competitive "pull" of the area | .8 |
| 37. Maximum interest on capital invested in present and future improvements | .7 |
| 49. Increasing intensity of adjacent land use | .7 |
| 55. Minimum anticipated risk in investments | .7 |
| 31. Maximum economic income from the land (capital gain) | .6 |
| 34. Prospective investment in public improvements | .6 |
| 36. Minimum operating costs | .6 |
| 38. Maximum product sales potential at particular site | .6 |
| 40. Minimum improvement costs | .6 |
| 54. Ease of? marketability of land titles | .6 |
| 61. Maximum knowledge of "whims" of land owners | .6 |
| 24. Availability of sewerage | .5 |
| 32. High assessed land value | .5 |
| 42. High intensity of land development | .5 |
| 46. Good drainage characteristics of soil | .5 |
| 47. Land not subject to flooding | .5 |
| 52. Protective orientation with respect to prevailing winds | .5 |
| 53. Utilization of natural pleasing features of landscape | .5 |
| 56. Minimum interest on borrowed money | .5 |
| 59. Maximum knowledge of change of patterns of value through time | .5 |
| 62. Maximum knowledge of "whims" of land occupants | .5 |
| 19. Nearness of storage (warehouses) to office and retail areas | .4 |
| 30. Provision of general residential amenities (upkeep, services) | .4 |
| 48. Low turnover of occupancy | .4 |
| 58. Convenient to streams of pedestrian traffic | .4 |
| 60. Maximum knowledge of use pattern change through time | .4 |

Factor Two (F2) - Convenience

| | Factor Loading |
|--|-------------------|
| 15. Nearness of work to recreation | .8 |
| 16. Nearness of home to recreation | .8 |
| 17. Nearness of home to shopping | .8 |
| 21. Nearness of home to religious facilities | .8 |
| 22. Nearness of home to social facilities | .8 |
| 23. Nearness of home to school facilities | .8 |
| 14. Nearness of home to work | .7 |
| 18. Nearness of home to health facilities | .6 |
| 12. Nearness to land. vehicular system | .5 |
| 13. Nearness to water vehicular systems | .5 |
| 29. Proximity to mixed uses | .5 |

SUB-PROBLEM LEVEL THREE - (Three Factor Solution)Factor One (F1) - Money, Trade and Efficiency

| | |
|---|----|
| 33. Strong competitive "pull" of the area | .8 |
| 37. Maximum interest on capital invested in present and future improvements | .7 |
| 55. Minimum anticipated risk in investments | .7 |
| 31. Maximum economic income from the land (capital gain) | .6 |
| 34. Prospective investment in public improvements | .6 |
| 36. Minimum operating costs | .6 |
| 38. Maximum product sales potential at particular site | .6 |
| 40. Minimum improvement costs | .6 |
| 49. Increasing intensity of adjacent land use | .6 |
| 54. Ease of marketability of land titles | .6 |
| 61. Maximum knowledge of "whims" of land owners | .6 |
| 24. Availability of sewerage | .5 |
| 30. Provision of general residential amenities (upkeep, services) | .5 |
| 32. High assessed land value | .5 |
| 42. High intensity of land development | .5 |
| 46. Good drainage characteristics of soil | .5 |
| 47. Land not subject to flooding | .5 |
| 48. Low turnover of occupancy | .5 |
| 52. Protective orientation with respect to prevailing winds | .5 |
| 53. Utilization of natural pleasing features of landscape | .5 |
| 56. Minimum interest on borrowed money | .5 |
| 59. Maximum knowledge of change of patterns of value through time | .5 |

| | Factor Loading |
|--|-------------------|
| 62. Maximum knowledge "whims" of land occupants | .5 |
| 11. Provision of possibilities for reasonable 60 aesthetic satisfaction | .4 |
| . Maximum knowledge of use pattern change through time | .4 |

Factor Two (F2) - Convenience

| | |
|--|----|
| 15. Nearness of work to recreation | .8 |
| 16. Nearness of home to recreation | .8 |
| 17. Nearness of home to shopping | .8 |
| 21. Nearness of home to religious facilities | .8 |
| 22. Nearness of home to social facilities | .8 |
| 23. Nearness of home to school facilities | .8 |
| 14. Newness of home to work | .7 |
| 18. Nearness of home to health facilities | .6 |
| 12. Nearness to land vehicular system | .5 |
| 13. Nearness to water vehicular systems | .5 |
| 29. Proximity to mixed uses | .5 |

Factor Three (F3) - Health and Safety

| | |
|---|----|
| 2. Protection against contagion | .7 |
| 6. Protection against atmospheric pollution | .7 |
| 1. Protection against accidents and hazards | .6 |
| 3. Provision for maintenance of cleanliness | .6 |
| 4. Provision of adequate daylight, sunshine and ventilation | .6 |
| 5. Protection against excessive noise | .5 |
| 8. Provision of adequate privacy | .5 |
| 11. Provision of possibilities for reasonable aesthetic satisfaction | .4 |

SUB-PROBLEM LEVEL FIVE - (Five Factor Solution)Factor One (F1) - Money, Trade and Efficiency

| | Factor Loading |
|--|-------------------|
| 33. Maximum economic income from the land (capital gain) | .8 |
| 33. Strong competitive "pull" of the area | .8 |
| 32. High assessed land value | .7 |
| 36. Minimum operating costs | .7 |
| 37. Maximum interest on capital invested in present and future improvements | .7 |
| 38. Maximum product sales potential at particular site | .7 |
| 42. High intensity of land development | .6 |
| 49. Increasing intensity of adjacent land use | .6 |
| 54. Ease of marketability of land titles | .6 |
| 55. Minimum anticipated risk in investments | .6 |
| 19. Nearness of storage (warehouses) to office and retail areas | .5 |
| 34. Prospective investment in public improvements | .5 |
| 39. Minimum commuting expenses | .5 |
| 11. Provision of possibilities for reasonable aesthetic satisfaction | .4 |
| 20. Nearness of retail to industrial areas | .4 |
| 30. Provision of general residential amenities | .4 |

Factor Two (F2) - Convenience

| | |
|--|----|
| 15. Nearness of work to recreation | .8 |
| 16. Nearness of home to recreation | .8 |
| 17. Nearness of home to shopping | .8 |
| 21. Nearness of home to religious facilities | .8 |
| 22. Nearness of home to social facilities | .8 |
| 23. Nearness of home to school facilities | .8 |
| 14. Nearness of home to work | .7 |
| 18. Nearness of home to health facilities | .6 |
| 29. Proximity to mixed uses | .6 |
| 13. Nearness to land vehicular system | .5 |
| 13. Nearness to water vehicular systems | .5 |

Factor Three (F3) - Health and Safety

| | |
|---------------------------------|----|
| 2. Protection against contagion | .8 |
|---------------------------------|----|

| | Factor Loading |
|--|-------------------|
| 3. Provision for maintenance of cleanliness | .7 |
| 6. Protection against atmospheric pollution and offensive odors | .7 |
| 1. Protection against accidents and hazards | .6 |
| 4. Provision of adequate daylight, sunshine and ventilation | .5 |
| 11. Provision of possibilities for reasonable aesthetic satisfaction | .5 |
| 5. Protection against excessive noise | .4 |
| 30. Provision of general residential amenities (upkeep, services) | .4 |

Factor Four (F4) - Knowledge of Present and Future Patterns and Safety

| | |
|---|----|
| 60. Maximum knowledge of use pattern change through time | .7 |
| 59. Maximum knowledge of change of patterns of value through time | .6 |
| 62. Maximum knowledge of "whims" of land occupants | .6 |
| 5. Protection against excessive noise | .5 |
| 61. Maximum knowledge of "whims" of land owners | .5 |
| 65. Diversification in industry | .5 |
| 67. Freedom from ethnic conflict | .5 |
| 68. Allowing "fringe" developments to occur | .5 |
| 8. Provision of adequate privacy | .4 |
| 10. Protection against moral hazards | .4 |

Factor Five (F5) - Land Characteristics

| | |
|---|----|
| 46. Good drainage characteristics of soil | .7 |
| 47. Land not subject to flooding | .7 |
| 52. Protective orientation with respect to prevailing winds | .7 |
| 24. Availability of sewerage | .6 |
| 51. Unpolluted ground water supply | .6 |
| 28. Separation from blighted areas (poverty, disease) | .5 |
| 40. Minimum improvement costs | .5 |
| 53. Utilization of natural pleasing features of landscape | .5 |
| 56. Minimum interest on borrowed money | .5 |
| 58. Convenient to streams of pedestrian traffic | .5 |

SUB-PROBLEM LEVEL SEVEN - --('Seven Factor Solution)Factor One (F1) - Money, Trade and Efficiency

| | Factor Loading |
|--|-------------------|
| 31. Maximum economic income from the land (capital gain) | .8 |
| 33. Strong competitive "pull" of the area | .8 |
| 36. Minimum operating costs | .8 |
| 32. High assessed land value | .7 |
| 38. Maximum product sales potential at particular site | .7 |
| 42. High intensity of land development | .7 |
| 37. Maximum interest on capital invested_ in present and future improvements | .6 |
| 49. Increasing intensity of adjacent land use | .6 |
| 54. Ease of marketability of land titles | .6 |
| 39. Minimum commuting expenses | .5 |
| 50. Decreasing intensity of adjacent land use | .5 |
| 55. Minimum anticipated risk in investments | .5 |
| 11. Provisions of possibilities for reasonable aesthetic satisfaction | .4 |
| 19. Nearness of storage (warehouses) to office and retail areas | .4 |
| 34. Prospective investment in public improvements | .4 |

Factor Two (F2) - Convenience

| | |
|---|----|
| 15. Nearness of work to recreation | .8 |
| 16. Nearness of home to recreation | .8 |
| 17. Nearness of home to shopping | .8 |
| 21. Nearness of home to religious facilities | .8 |
| 22. Nearness of home to social facilities | .8 |
| 23. Nearness of home to school facilities | .8 |
| 14. Nearness of home to work | .7 |
| 18. Nearness of home to health facilities | .6 |
| 29. Proximity to mixed uses | .5 |
| 9. Provision of opportunities for normal family and community life | .4 |
| 12. Nearness to land vehicular system | .4 |
| 13. Nearness to water vehicular systems | .4 |
| 19. Nearness to storage (warehouses) to office and retail areas | .4 |

Factor Three (F3) - Health and Safety

| | Factor Loading |
|--|-------------------|
| 2. Protection against contagion | .8 |
| 6. Protection against atmospheric pollution and offensive odors | .8 |
| 1. Protection against accidents and hazards | .7 |
| 3. Provision for maintenance of cleanliness | .6 |
| 4. Provision of adequate daylight, sunshine and Ventilation | .6 |
| 11. Frovision of possibilities for reasonable aesthetic satisfaction | .5 |

Factor Four (F4) - Knowledge of Present and Future Patterns and Safety

| | |
|---|----|
| 5. Protection against excessive noise | .5 |
| 8. Provision of adequate privacy | .5 |
| 10. Protection against moral hazards | .5 |
| 26. Proximity to same ethnic area | .5 |
| 59. Maximum knowledge of change of patterns of value through time | .5 |
| 60. Maximum knowledge of use pattern change through time | .5 |
| 62. Maximum knowledge of "whims" of land occupants | .5 |
| 65. Diversification in industry | .5 |
| 67. Freedom from ethnic conflict | .5 |
| 68. Allowing "fringe" developments to occur | .5 |
| 61. Maximum knowledge of "whims" of land owners | .4 |

Factor Five (F5) - General Amenities

| | |
|--|----|
| 40. Minimum improvement costs | .7 |
| 24. Availability of sewerage | .6 |
| 28. Separation from blighted areas (poverty, disease) | .6 |
| 34. Prospective investment in public improvements | .5 |
| 53. Utilization of natural pleasing features of 'landscapes' | .5 |
| 58. Conversion of streams of 'pedestrian traffic' | .5 |
| 47. Land not subject to flooding | .4 |

Factor Six (F6) - Slope of LandFactor
Loading

45. Terrain slope of 15+ degrees .7

Factor Seven (F7) Community Stability

29. Proximity to mixed uses .6
 25. Availability of zoning protection .5
 30. Provision of general residential amenities
 (upkeep, services) .5
 12. Nearness to land vehicular system .4

SUB-PROBLEM LEVEL NINE - (Nine Factor Solution)Factor One (F1) - Money, Trade and Efficiency

33. Strong competitive "pull" of the area .8
 31. Maximum economic income from the land
 ('capital gain) .7
 32. High assessed land value .7
 36. Minimum operating costs .7
 38. Maximum product sales potential at particular site .7
 42. High intensity of land development .7
 49. Increasing intensity of adjacent land use .7
 37. Maximum interest on capital invested in present
 and future improvements .6
 50. Decreasing intensity of adjacent land use .6
 54. Ease of marketability of land titles .6
 39. Minimum commuting expenses .5
 55. Minimum anticipated risk in investments .5
 11. Provision of possibilities for reasonable
 aesthetic satisfaction .4
 34. Prospective investment in public improvements .4

Factor Two (F2) - Convenience

21. Nearness of home to religious facilities .8
 22. Nearness of home to social facilities .8

| | Factor Loading |
|---|-------------------|
| 23. Nearness of home to school facilities | .8 |
| 16. Nearness of home to recreation | .7 |
| 17. Nearness of home to shopping | .7 |
| 13. Nearness to water vehicular systems | .6 |
| 15. Nearness of work to recreation | .6 |
| 12. Nearness to land vehicular systems | .5 |
| 14. Nearness of home to work | .5 |
| 29. Proximity to mixed uses | .5 |
| 18. Nearness of home to health facilities | .4 |
| 63. Minimum speculative subdivision of land | .4 |

Factor Three (F3) - Health and Safety

| | |
|--|----|
| 1. Protection against accidents and hazards | .8 |
| 2. Protection against Contagion | .8 |
| 6. Protection against atmospheric pollution and offensive odors | .8 |
| 3. Provision for maintenance of cleanliness | .6 |
| 4. Provision of adequate daylight, sunshine and ventilation | .6 |
| 5. Protection against excessive noise | .5 |
| 11. Provision of possibilities for reasonable aesthetic satisfaction | .5 |
| 8. Provision of adequate privacy | .4 |

Factor Four (F4) - Knowledge or "Present and Future Patterns

| | |
|---|----|
| 59. Maximum knowledge of change of patterns of value through time | .8 |
| 60. Maximum knowledge of use pattern change through time | .8 |
| 61. Maximum knowledge of "whims" of land owners | .7 |
| 62. Maximum knowledge of "whims" of land occupants | .7 |
| 68. Allowing "fringe" developments to occur | .5 |
| 26. Proximity to same ethnic area | .4 |
| 65. Diversification in industry | .4 |

Factor Five (F5) - Land Characteristics

| | Factor Loading |
|---|-------------------|
| 46. Good drainage characteristics of soil | .8 |
| 47. Land not subject to flooding | .7 |
| 52. Protective orientation with respect to prevailing winds | .7 |
| 51. Unpolluted ground water supply | .6 |
| 24. Availability of sewerage | .5 |
| 44. Terrain slope of 0-15 degrees | .5 |
| 40. Minimum improvement costs | .4 |
| 53. Utilization of natural pleasing features of landscape | .4 |

Factor Six (F6) - Proximity To Blighted Areas

| | |
|---|----|
| 27. Proximity to blighted, areas (poverty, disease) | .8 |
|---|----|

Factor Seven (F7) - Community Stability

| | |
|---|----|
| 30. Provision of general residential amenities (upkeep, services) | .6 |
| 25. Availability of zoning protection | .5 |
| 35. Minimum local property taxes | .4 |
| 48. Low turnover of occupancy | .4 |
| 67. Freedom from ethnic conflict | .4 |

Factor Eight (F8) - Slope of Land

| | |
|----------------------------------|----|
| 45. Terrain slope of 15+ degrees | .7 |
|----------------------------------|----|

Factor Nine (F9) - Retail and Industrial Convenience

| | |
|---|----|
| 19. Nearness of storage (warehouses) to office and retail areas | .8 |
|---|----|

| | Factor Loading |
|--|-------------------|
| 20. Nearness of retail to industrial areas | .8 |
| 18. Nearness of home to health facilities | .6 |
| 14. Nearness of home to work | .5 |
| 15. Nearness of work to recreation | .5 |
| 17. Nearness of home to shopping | .5 |

SUB-PROBLEM LEVEL TWELVE (Twelve Factor Solution)

Factor One (F1) - Money, Trade and Efficiency

| | |
|--|----|
| 31. Maximum economic income from the land (capital gain) | .8 |
| 33. Strong competitive "pull" of the area | .8 |
| 36. Minimum operating costs | .8 |
| 32. High assessed land value | .7 |
| 38. Maximum product sales potential at particular site | .7 |
| 42. High intensity of land development | .7 |
| 37. Maximum interest on capital invested in present and future improvements | .6 |
| 49. Increasing intensity of adjacent land use | .6 |
| 54. Ease of marketability of land titles | .6 |
| 34. Prospective investment in public improvements | .5 |
| 55. Minimum anticipated risk in investments | .5 |
| 11. Provision of possibilities for reasonable aesthetic satisfaction | .4 |
| 39. Minimum commuting expenses | .4 |

Factor Two (F2) - Convenience

| | |
|--|----|
| 15. Nearness of work to recreation | .8 |
| 16. Nearness of home to recreation | .8 |
| 17. Nearness of home to shopping | .8 |
| 21. Nearness of home to religious facilities | .8 |
| 22. Nearness of home to social facilities | .8 |
| 23. Nearness of home to school facilities | .8 |
| 14. Nearness of home to work | .7 |
| 18. Nearness of home to health facilities | .7 |

Factor Three (F3) - Health and Safety

| | Factor Loading |
|--|-------------------|
| 1. Protection against accidents and hazards | .8 |
| 2. Protection against contagion | .8 |
| 6. Protection against atmospheric pollution and offensive odors | .7 |
| 3. Provision for maintenance of cleanliness | .6 |
| 4. Provision of adequate daylight, sunshine and ventilation | .6 |
| 11. Provision of possibilities for reasonable aesthetic satisfaction | .5 |
| 5. Protection against excessive noise | .4 |

Factor Four (F4) - Knowledge of Present and Future Patterns

| | |
|---|----|
| 59. Maximum knowledge of change of patterns of value through time | .8 |
| 60. Maximum knowledge of use pattern change through time | .8 |
| 62. Maximum knowledge of "whims" of land occupants | .8 |
| 61. Maximum knowledge of "whims" of land owners | .7 |

Factor Five (F5) - Land Characteristics

| | |
|---|----|
| 46. Good drainage characteristics of soil | .8 |
| 51. Unpolluted ground water supply | .7 |
| 52. Protective orientation with respect to prevailing winds | .7 |
| 47. Land not subject to flooding | .6 |
| 44. Availability of sewerage | .5 |
| 53. Utilization of natural pleasing features of landscape | .5 |
| 56. Minimum interest on borrowed money | .4 |

Factor Six (F6) - Proximity To Blighted Areas

| | |
|--|----|
| 27. Proximity to blighted areas (poverty, disease) | .8 |
|--|----|

Factor Seven (F7) - Convenience

| | Factor Loading |
|---|-------------------|
| 12. Nearness to land vehicular system | .7 |
| 29. Proximity to mixed uses | .7 |
| 13. Nearness to water vehicular systems | .5 |
| 42. High intensity of land development | .4 |
| 58. Convenient to streams of pedestrian traffic | .4 |

Factor Eight (F8) - Slope of Land

| | |
|---|----|
| 45. Terrain slope of 15+ degrees | .7 |
| 44. Terrain slope of 0-15 degrees | .5 |
| 50. Decreasing intensity of adjacent land use | .4 |

Factor Nine (F9)- Retail and industrial Convenience

| | |
|---|----|
| 19. Nearness of storage (warehouses) to office and retail areas | .8 |
| 20. Nearness of retail to industrial areas | .8 |

Factor Ten (F10)- Community Stability

| | |
|---|----|
| 67. Freedom from ethnic conflict | .6 |
| 25. Availability of zoning protection | .5 |
| 30. Provision of general residential amenities (upkeep, services) | .5 |
| 66. Variety and opportunity for choice in way of life | .5 |

Factor Eleven (F11)-Stability

| | |
|---|----|
| 63. Minimum speculative subdivision of land | .6 |
| 48. Low turnover of occupancy | .4 |

Factor Twelve (F12) - Safety and Patterns

| | Factor Loading |
|---|-------------------|
| 68. Allowing "fringe" developments to occur | .6 |
| 5. Protection against excessive noise | .5 |
| 8. Provision of adequate privacy | .5 |
| 10. Protection against moral hazards | .5 |
| 65. Diversification in industry | .5 |

SUB-PROBLEM LEVEL FOURTEEN - (Fourteen Factor Solution)Factor One (F1) - Land Characteristics

| | |
|---|----|
| 46. Good drainage characteristics of soil | .8 |
| 52. Protective orientation with respect to prevailing winds | .8 |
| 47. Land not subject to flooding | .7 |
| 51. Unpolluted ground water supply | .6 |
| 53. Utilization of natural pleasing features of landscape | .5 |

Factor Two (F2) - Convenience

| | |
|--|----|
| 17. Nearness of home to shopping | .9 |
| 21. Nearness of home to religious facilities | .9 |
| 22. Nearness of home to social facilities | .9 |
| 15. Nearness of work to recreation | .8 |
| 16. Nearness of home to recreation | .8 |
| 23. Nearness of home to school facilities | .8 |
| 14. Nearness of home to work | .7 |
| 18. Nearness of home to health facilities | .7 |

Factor Three (F3) - Health and Safety

| | |
|---|----|
| 1. Protection against accidents and hazards | .8 |
| 2. Protection against contagion | .8 |
| 6. Protection against atmospheric pollution and offensive odors | .8 |
| 3. Provision for maintenance of cleanliness | .6 |

| | Factor Loading |
|--|-------------------|
| 4. Provision of adequate daylight, sunshine and ventilation | .6 |
| 11. Provision of possibilities for reasonable aesthetic satisfaction | .5 |
| 5. Protection against excessive noise | .4 |

Factor Four (F4) - Knowledge of Present and Future Patterns

| | |
|---|----|
| 59. Maximum knowledge of change of patterns of value through time | .8 |
| 60. Maximum knowledge of use pattern change through time | .8 |
| 62. Maximum knowledge of "whims" of land occupants | .8 |
| 61. Maximum knowledge of "whims" of land owners | .7 |

Factor Five (F5) - Money, Trade and Efficiency

| | |
|---|----|
| 31. Maximum economic income from the land (capital gain) | .8 |
| 33. Strong competitive "pull" of the area | .8 |
| 36. Minimum operating costs | .8 |
| 38. Maximum product sales potential at particular site | .8 |
| 32. High assessed land value | .7 |
| 37. Maximum interest on capital invested in present and future improvements | .7 |
| 42. High intensity of land development | .7 |
| 49. Increasing intensity of adjacent land use | .6 |
| 11. Provision of possibilities for reasonable aesthetic satisfaction | .5 |
| 34. Prospective investment in public improvements | .5 |
| 54. Ease of marketability of land titles | .5 |
| 39. Minimum commuting expenses | .4 |
| 40. Minimum improvement costs | .4 |
| 55. Minimum anticipated risk in investments | .4 |

Factor Six (F6) - Proximity To Blighted Areas Factor
Loading

27. Proximity to blighted areas (poverty, disease) .8

Factor Seven (F7) - Convenience

12. Nearness to land vehicular system .7

29. Proximity to mixed uses .7

13. Nearness to water vehicular systems .5

41. Large supply of competitive settlement land .4

Factor Eight (F8) - Slope of Land

44. Terrain slope of 0-15 degrees .6

45. Terrain slope of 15+ degrees .6

Factor Nine (F9) - Retail and Industrial Convenience

19. Nearness of storage (warehouses) to office and
retail areas .8

20. Nearness of retail to industrial areas .8

Factor Ten (F10) - Community Stability

67. Freedom from ethnic conflict .6

25. Availability of zoning protection .5

66. Variety and opportunity for choice in way of life .5

30. Provision of general residential amenities .4

Factor Eleven (F11) - StabilityFactor
Loading

| | | |
|-----|---|----|
| 48. | Low turnover of Occupancy | .5 |
| 63. | Minimum speculative subdivision of land | .5 |
| 24. | Availability of sewerage | .4 |

Factor Twelve (F12) - Safety and Patterns

| | | |
|-----|---|----|
| 10. | Protection against moral hazards | .6 |
| 65. | Diversification in industry | .6 |
| 68. | Allowing "fringe" developments to occur | .5 |
| 5. | Protection against excessive noise | .4 |
| 8. | Provision of adequate privacy | .4 |

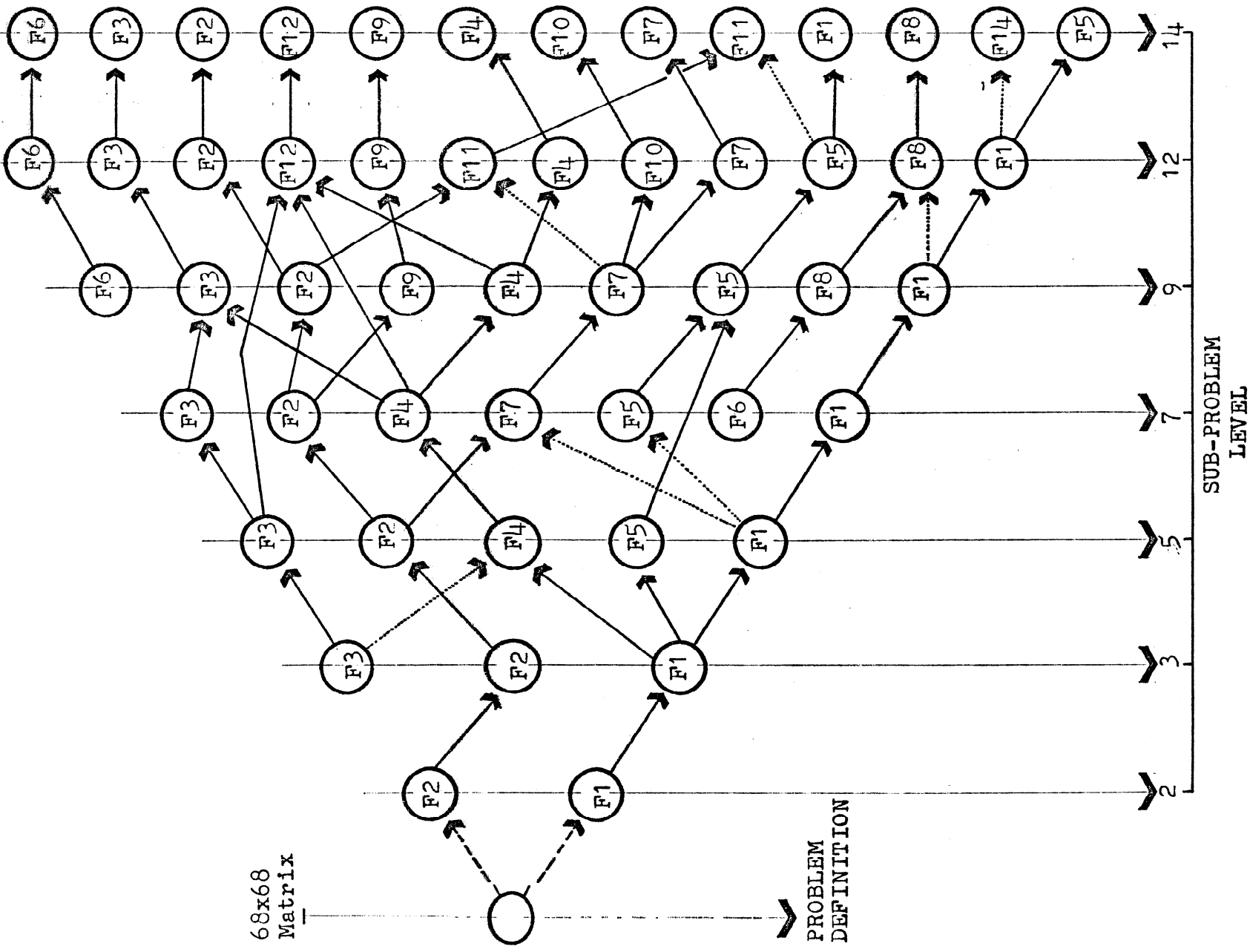
Factor Thirteen (F13) - (Not included)

No factor loading of .4 or greater

Factor Fourteen (F14) - Money

| | | |
|-----|---|----|
| 37. | Maximum interest on capital invested in present and future improvements | .4 |
|-----|---|----|

EXAMPLE 2 - CHARACTERISTICS GROUPED BY Note: Components F13 have no significant loadings
 Section D - DIAGRAM OF FACTOR GROUPINGS

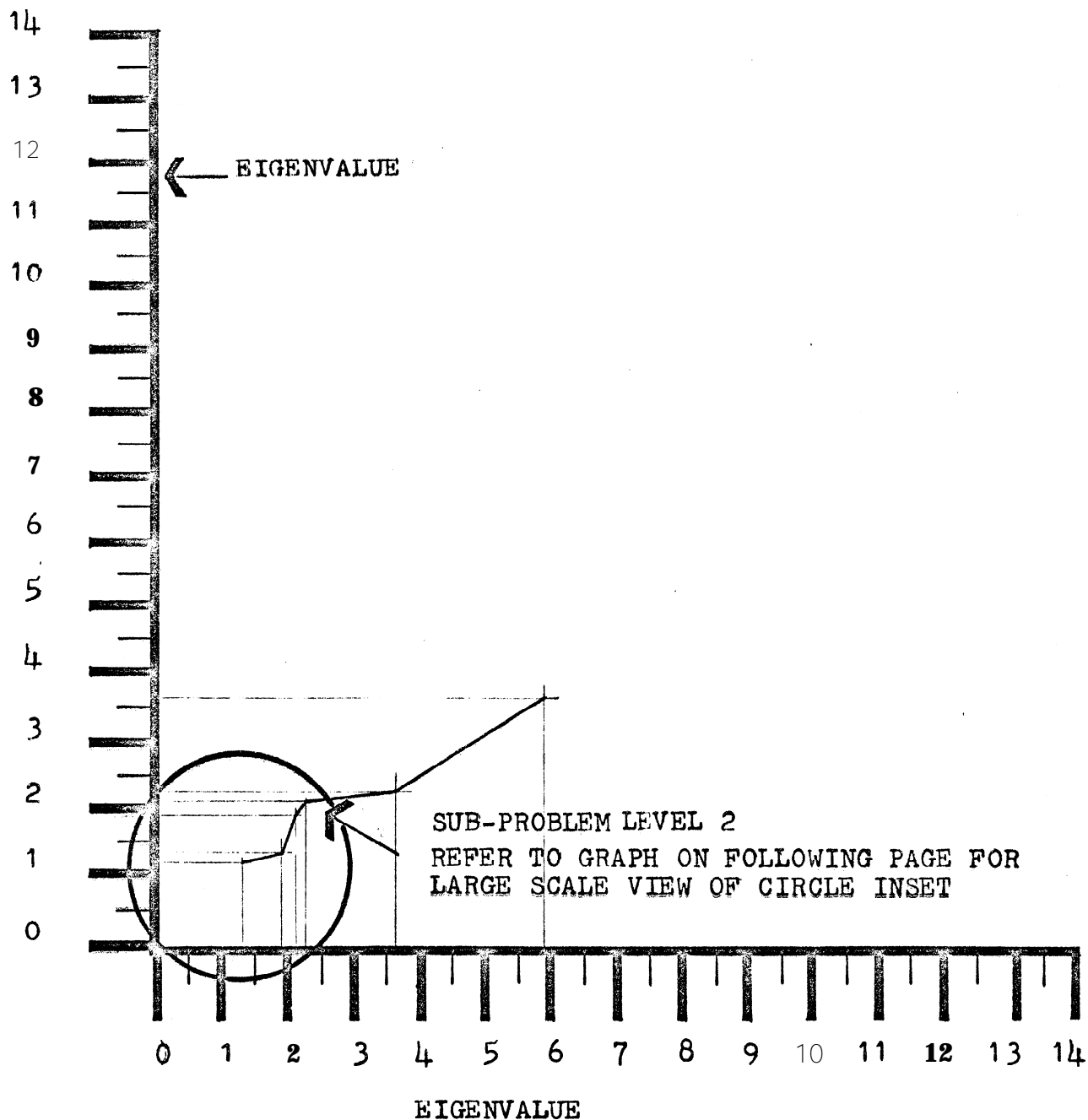


APPENDIX THREE

EXAMPLE 3 - PEOPLE GROUPED BY CHARACTERISTICSSection A - LIST OF 30 COMPONENTS

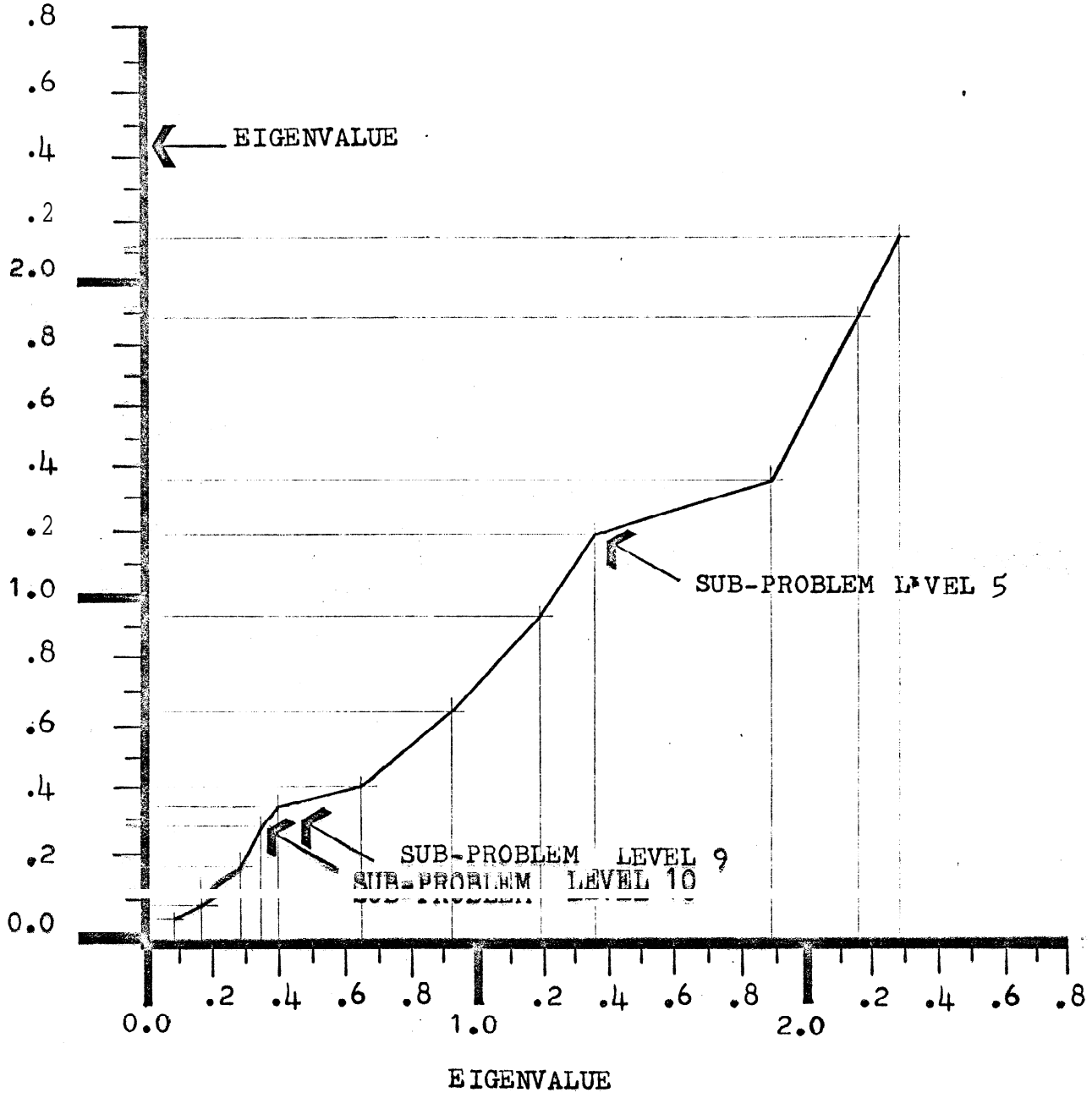
1. Children 0-16 of local families
2. Children 0-16 of non-local families
3. Native girls 16-21
4. Native boys 16-21
5. White girls **16-21**
6. White boys 16-21
7. Unmarried native women (over **21**)
8. Unmarried native men (over **21**)
9. Unmarried permanent white women
10. Unmarried permanent white men
11. Unmarried transient white women
12. Unmarried transient white men
13. Local married native couples
14. Non-local married native couples
15. Married permanent white couples
16. Married transient white couples
17. Trades labor
18. Skilled labor
19. Unskilled labor
20. Managerial and professional employment
21. Self-employed as owner/manager
22. Self-employed as harvester of natural resources
23. Unemployment
24. Gainful employment in the home
25. "Employment" as vocational student
26. Membership in educational clubs/associations
27. Membership in community and service clubs/associations
28. Membership in occupational clubs/associations
29. Membership in religious groups
30. Membership in recreational clubs/associations

EXAMPLE 3 PEOPLE GROUPED BY CHARACTERISTICS

Section B - GRAPH OF EIGENVALUES

EXAMPLE 3 PEOPLE GROUPED BY CHARACTERISTICS

Section B - EIGENVALUES (CONT'D)



EXAMPLE 3

Section C - FACTOR BREAKDOWNSSUB-PROBLEM LEVEL TWO - (Two Factor Solution)Factor One (F1) - Youths, Unmarried and Children

| | Factor Loading |
|--|-------------------|
| 6. White boys 16-21 | .8 |
| 3. Native girls 16-21 | .7 |
| 5. White girls 16-21 | .7 |
| 7. Unmarried native women (over 21) | .7 |
| 9. Unmarried permanent white women | .7 |
| 1. Children 0-16 of local families | .6 |
| 2. Children 0-16 of non-local families | .6 |
| 4. Native boys 16-21 | .6 |
| 10. Unmarried permanent white men | .6 |
| 8. Unmarried native men (over 21) | .5 |
| 14. Non-local married native couples | .4 |

Factor Two (F2) - Labor

| | |
|---|----|
| 17. Trades labor | .9 |
| 18. Skilled labor | .9 |
| 19. Unskilled labor | .9 |
| 22. Self-employed as harvester of natural resources | .4 |

SUB-PROBLEM FIVE - (Five Factor Solution)Factor One (F1) - Youths, Unmarried and Children

| | |
|--|----|
| 1. Children 0-16 of local families | .7 |
| 2. Children 0-16 of non-local families | .7 |
| 4. Native boys 16-21 | .7 |
| 6. White boys 16-21 | .7 |
| 7. Unmarried native women (over 21) | .7 |
| 8. Unmarried native men (over 21) | .7 |
| 3. Native girls 16-21 | .6 |
| 5. White girls 16-21 | .6 |

| | Factor Loading |
|------------------------------------|-------------------|
| 9. Unmarried permanent white women | .6 |
| 10. Unmarried permanent white men | .6 |

Factor Two (F2) - Labor

| | |
|--|-----|
| 17. Trades labor | 1.0 |
| 19. Unskilled labor | 1.0 |
| 18. Skilled labor | .9 |
| 22. Self-employed as harvester of natural resources | .4 |

Factor Three (F3) - Transient, Youths and
Home Employment

| | |
|-------------------------------------|----|
| 11. Unmarried transient white women | .6 |
| 16. Harried transient white couples | .6 |
| 24. Gainful employment in home | .5 |
| 5. White girls 16-21 | .4 |
| 12. Unmarried transient white men | .4 |

Factor Four (F4) - Owner, Manager and Professional

| | |
|--|----|
| 20. Managerial and professional employment | .7 |
| 21. Self-employed as owner/manager | .7 |

Factor Five (F5) - Permanent Peoples (Adults)

| | |
|-------------------------------------|----|
| 15. Married permanent white couples | .9 |
| 13. Local married native couples | .8 |
| 9. Unmarried permanent white women | .5 |
| 10. Unmarried permanent white men | .5 |

SUB-PROBLEM LEVEL NINE - (Nine Factor Solution)Factor One (F1) - Youths and Unmarried

| | Factor Loading |
|--------------------------------------|-------------------|
| 4 | |
| 8. Native boys 16-21 | .8 |
| . Unmarried native men (over 21) | .8 |
| 7. Unmarried native women (over 21) | .7 |
| 3. Native girls 16-21 | .5 |
| 10. Unmarried permanent white men | .5 |
| 6. White boys 16-21 | .4 |
| 9. Unmarried permanent white women | .4 |
| 14. Non-local married native couples | .4 |

Factor Two (F2) - Labor

| | |
|---------------------|-----|
| 17. Trades labor | 1.0 |
| 19. Unskilled labor | 1.0 |
| 18. Skilled labor | .9 |

Factor Three (F3) - Transients, Youths and Home
Employment

| | |
|-------------------------------------|----|
| 11. Unmarried transient white women | .8 |
| 12. Unmarried transient white men | .7 |
| 24. Gainful employment in home | .6 |
| 6. White boys 16-21 | .5 |
| 5. White girls 16-21 | .4 |

Factor Four (F4) - Permanent Peoples(Adults),
Community Clubs

| | |
|--|----|
| 15. Married permanent white couples | .9 |
| 13. Local married native couples | .8 |
| 9. Unmarried permanent white women | .5 |
| 10. Unmarried permanent white men | .5 |
| 27. Membership in community and service clubs/ associations | .4 |

Factor Five (F5) - Owner, Manager and Professional Factor Loading

- | | | |
|-----|--|----|
| 20. | Managerial and professional employment | .9 |
| 21. | Self-employed as owner/manager | .9 |

Factor Six (F6) - Children

- | | | |
|----|-------------------------------------|-----|
| 1. | Children 0-16 of local families | 1.0 |
| 2. | Children 0-16 of non-local families | 1.0 |

Factor Seven (F7) - Membership In Clubs

- | | | |
|-----|---|----|
| 26. | Membership in educational clubs/associations | .7 |
| 29. | Membership in religious groups | .7 |
| 14. | Non-local married native couples | .5 |
| 30. | Membership in recreational clubs/associations | .5 |

Factor Eight (F8)- Youths (Girls)

- | | | |
|-----|------------------------------------|----|
| 3. | Native girls 16-21 | .6 |
| 5. | White girls 16-21 | .6 |
| 25. | "Employment" as vocational student | .4 |

Factor Nine (F9)- Land Oriented Peoples

- | | | |
|-----|---|----|
| 22. | Self-employed as harvester of natural resources | .5 |
| 28. | Membership in occupational clubs/associations | .4 |

SUB-PROBLEM LEVEL TEN - (Ten Factor Solution)Factor One (F1) - Youths and Unmarried

| | Factor Loading |
|-------------------------------------|-------------------|
| 7. Unmarried native women (over 21) | .8 |
| 8. Unmarried native men (over 21) | .8 |
| 4. Native boys 16-21 | .7 |
| 3. Native girls 16-21 | .6 |
| 6. White boys 16-21 | .5 |
| 9. Unmarried permanent white women | .5 |
| 10. Unmarried permanent white men | .5 |

Factor Two (F2) - Labor

| | |
|---------------------|-----|
| 17. Trades labor | 1.0 |
| 19. Unskilled labor | 1.0 |
| 18. Skilled labor | .9 |

Factor Three (F3) - Transients, Youths and Home
Employment

| | |
|-------------------------------------|----|
| 11. Unmarried transient white women | .8 |
| 12. Unmarried transient white men | .7 |
| 24. Gainful employment in home | .6 |
| 6. White boys 16-21 | .5 |
| 5. White girls 16-21 | .4 |

Factor Four (F4) - Permanent Peoples (Adults)

| | |
|-------------------------------------|----|
| 15. Married permanent white couples | .9 |
| 13. Local married native couples | .8 |
| 9. Unmarried permanent white women | .5 |
| 10. Unmarried permanent white men | .5 |

Factor Five (F5) - Owner, Manager and Professional Factor Loading

- | | | |
|-----|--|----|
| 20. | Managerial and professional employment | .9 |
| 21. | Self-employed as owner/manager | .9 |

Factor Six (F6) - Children

- | | | |
|----|-------------------------------------|-----|
| 1. | Children 0-16 of local families | 1.0 |
| 2. | Children 0-16 of non-local families | 1.0 |

Factor Seven (F7) - Membership In Clubs

- | | | |
|-----|---|----|
| 26. | Membership in educational clubs/associations | .7 |
| 29. | Membership in religious groups | .7 |
| 14. | Non-local married native couples | .5 |
| 30. | Membership in recreational clubs/associations | .5 |

Factor Eight (F8) Ypuths (Girls)

- | | | |
|-----|-------------------------------------|----|
| 5. | White girls 16-21 | .6 |
| 3. | Native girls 16-21 | .5 |
| 25. | "Employment" as vocational students | .5 |

Factor Nine (F9) - Land Oriented Peoples

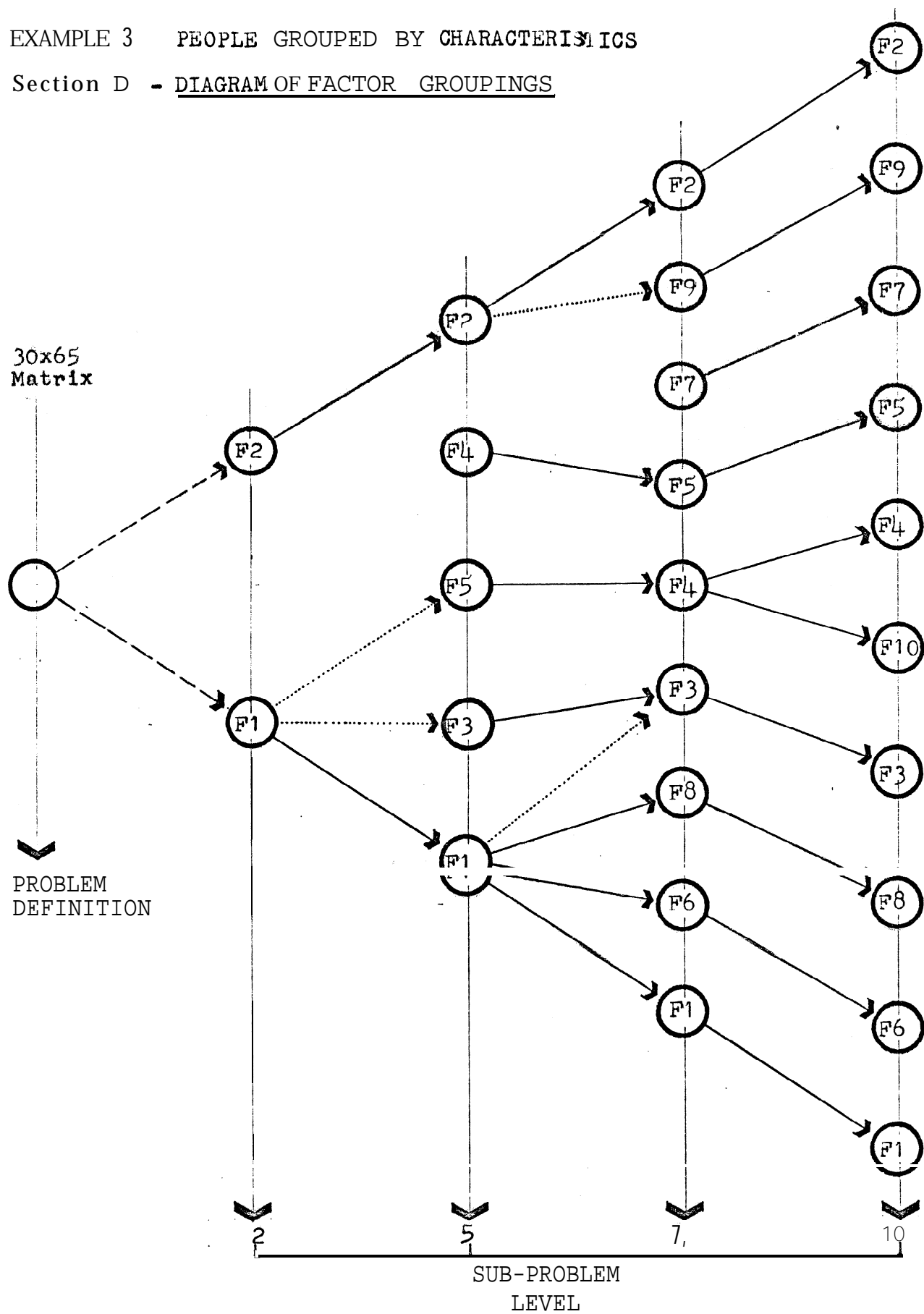
- | | | |
|-----|---|----|
| 22. | Self-employed as harvester of natural resources | .6 |
|-----|---|----|

Factor Ten (F10) - Community Clubs

- | | | |
|-----|--|----|
| 27. | Membership in community and service clubs/associations | .6 |
|-----|--|----|

EXAMPLE 3 PEOPLE GROUPED BY CHARACTERISTICS

Section D - DIAGRAM OF FACTOR GROUPINGS



APPENDIX FOUR

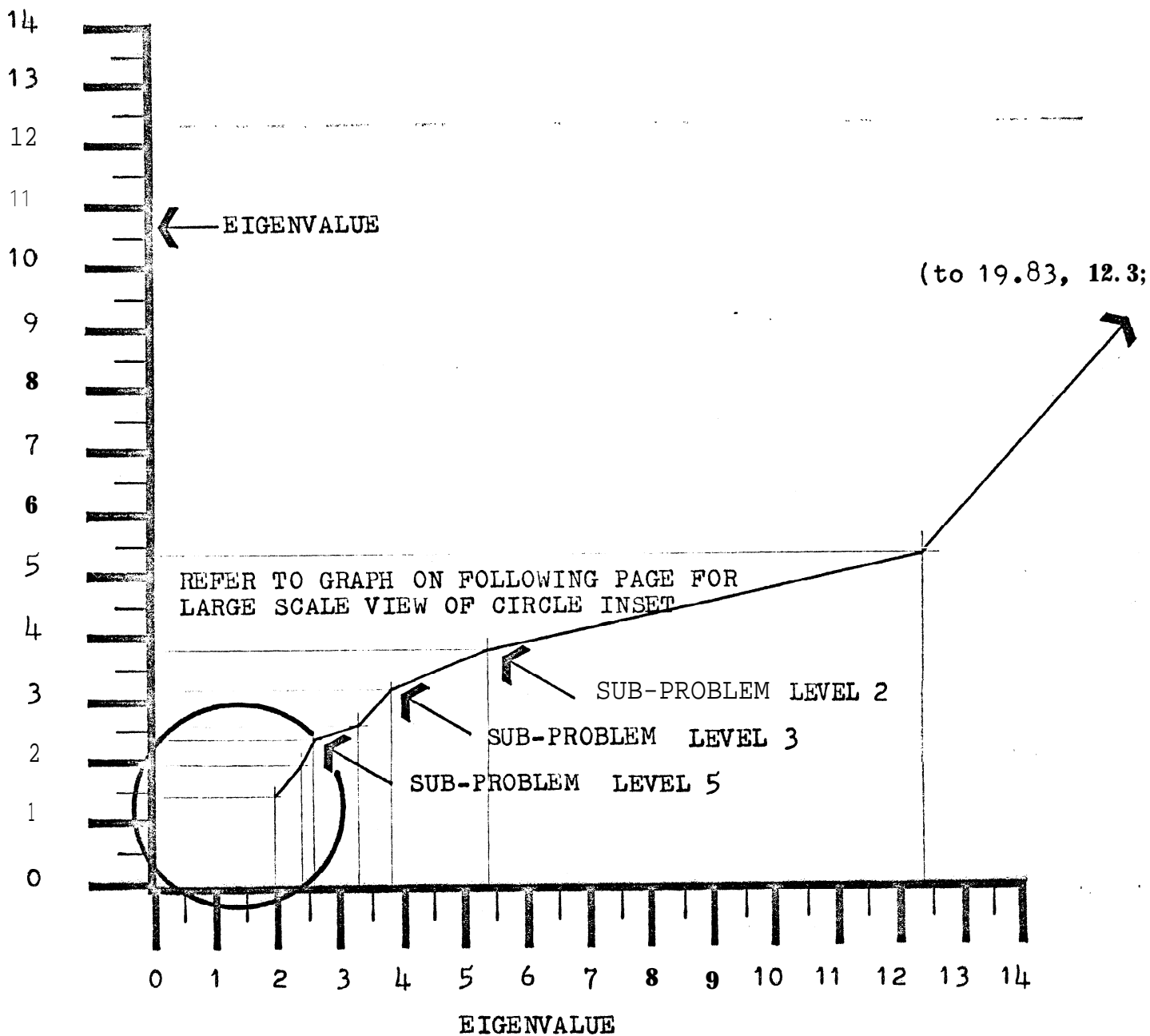
EXAMPLE 4 - CHARACTERISTICS GROUPED BY PEOPLESection A - LIST OF 65 COMPONENTS

1. Protection against accidents and hazards
2. Protection against contagion
3. Provision for maintenance of cleanliness
4. Provision of adequate daylight, sunshine and ventilation
5. Protection against excessive noise
6. Protection against atmospheric pollution and offensive odors
7. Provision from fatigue
8. Provision of adequate privacy
9. Provision of opportunities for normal family and community life
10. Protection against moral hazards
11. Provision for possibilities for reasonable aesthetic satisfaction
- 12^a. Nearness to land vehicular system
13. Nearness to water vehicular systems
14. Nearness of home to work
15. Nearness of work to recreation
- 16.** Nearness of home to recreation
- 17.** Nearness of home to shopping
18. Nearness of home to health facilities
19. Nearness of storage (warehouses) to office and retail areas
20. Nearness of retail to industrial areas
21. Nearness of home to religious facilities
22. Nearness of home to social facilities
23. Nearness of home to school facilities
24. Availability of sewerage
25. Availability of zoning protection
26. Proximity to same ethnic area
27. Proximity to blighted areas (poverty, disease)
28. Separation from blighted areas (poverty, disease)
29. Proximity to mixed uses
30. Provision of general residential amenities (upkeep, services)
31. Maximum economic income from the land (capital gain)
32. High assessed land value
33. Strong competitive "pull" of the area
34. Prospective investment in public improvements
35. Minimum local property taxes
36. Minimum operating costs
37. Maximum interest on capital invested in present and future improvements
38. Maximum product sales potential at particular site

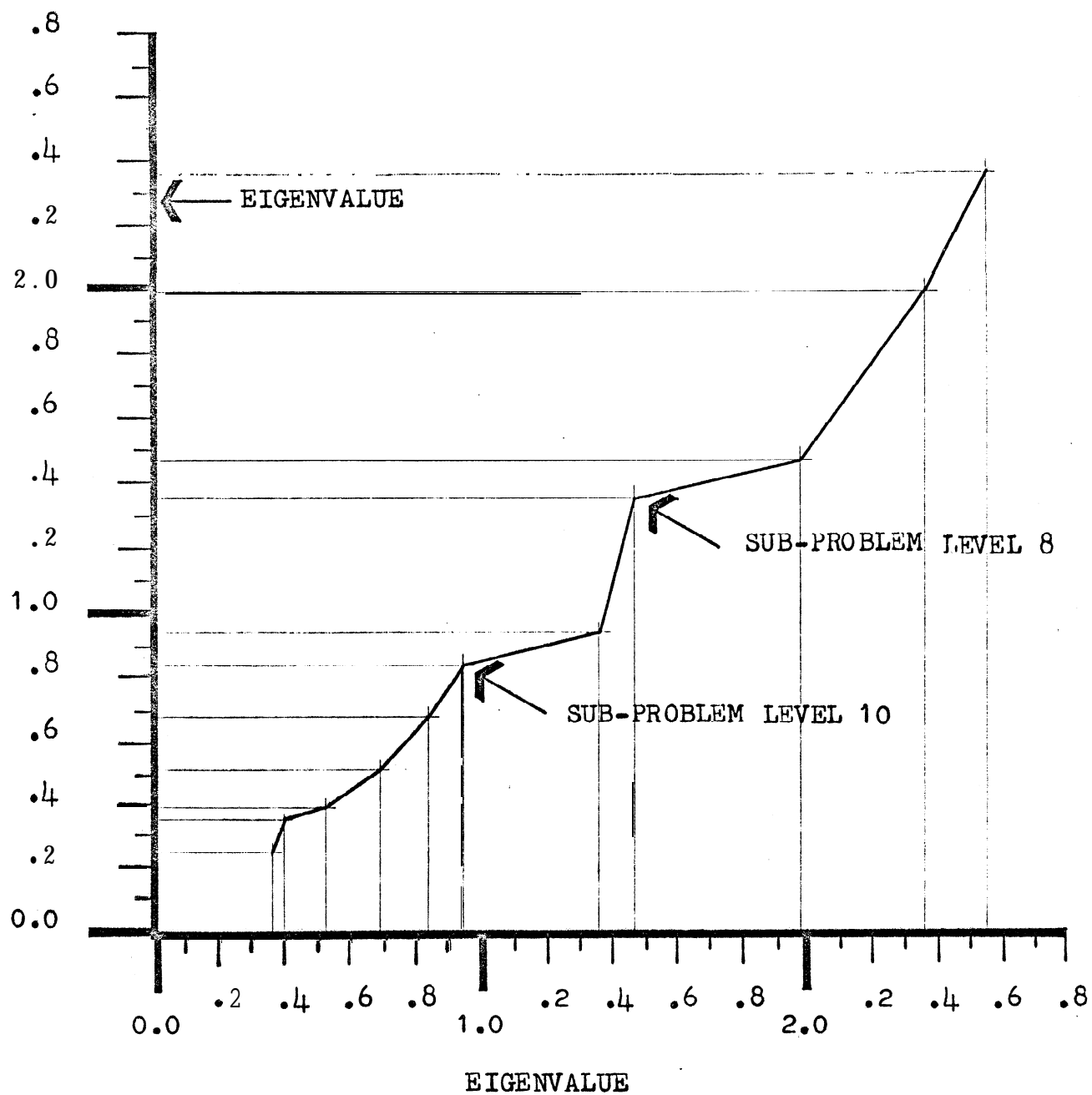
39. Minimum commuting expenses
40. Minimum improvement costs
41. Large supply of competitive settlement land
42. High intensity of land development
43. Good drainage characteristics of soil
44. Land not subject to flooding
45. Low turnover of occupancy
46. Increasing. intensity of adjacent land use
47. Decreasing intensity of adjacent land use
48. Unpolluted ground water supply
49. Protective orientation with respect to prevailing winds
50. Utilization of natural pleasing features of landscape
51. Ease of marketability of land titles
52. Minimum anticipated risks in investments
53. Minimum interest on borrowed money
54. Maximum interest on loaned money
55. Convenient to streams of pedestrian traffic
56. Maximum knowledge of change of patterns of value through time
57. Maximum knowledge of use pattern change through time
58. Maximum knowledge of "whims" of land owners
59. Maximum knowledge of "whims" of land occupants
60. Minimum speculative subdivision of land
61. Minimum land vehicular traffic congestion
62. Diversification in industry
63. Variety and opportunity for choice in way of life
64. Freedom from ethnic conflict
65. Allowing "fringe" developments to occur

EXAMPLE 4 - CHARACTERISTICS GROUPED BY PEOPLE

Section B - GRAPH OF EIGENVALUES



EXAMPLE 4 - CHARACTERISTICS GROUPED BY PEOPLE

Section B - EIGENVALUES (CONT'D)

EXAMPLE 4

Section C - FACTOR BREAKDOWNSSUB- PROBLEM LEVEL TWO - (Two Factor Solution)

| Factor One (F1)- <u>Money, Trade and Efficiency</u> | Factor Loading |
|---|----------------|
| 31. Maximum economic income from the land (capital gain) | .9 |
| 32. High assessed J-and value | .9 |
| 37. Maximum interest on capital invested in present and future improvements | .9 |
| 41. Large supply of competitive settlement land | .9 |
| 45. Low turnover of occupancy | .9 |
| 56. Maximum knowledge of change of patterns of value through time | .9 |
| 57. Maximum knowledge of use pattern change through time | .9 |
| 58. Maximum knowledge of "whims" of land owners | .9 |
| 59. Maximum knowledge of "whims" of land occupants | .9 |
| 19. Nearness of storage (warehouses) to office and retail areas | .8 |
| 33. Strong competitive "pull" of the area | .8 |
| 34. Prospective investment in public improvements | .8 |
| 38. Maximum product sales potential at particular site | .8 |
| 51. Ease of marketability of land titles | .8 |
| 52. Minimum anticipated risk in investment | .8 |
| 53. Minimum interest on borrowed money | .8 |
| 61. Minimum land vehicular traffic congestion | .8 |
| 25. Availability of zoning protection | .7 |
| 35. Minimum local property taxes | .7 |
| 36. Minimum operating costs | .7 |
| 40. Minimum improvement costs | .7 |
| 15. Nearness of work to recreation | .6 |
| 43. Good drainage characteristics of soil | .6 |
| 44. Land not subject to flooding | .6 |
| 49. Protective orientation with respect to prevailing winds | .6 |
| 20. Nearness of retail to industrial areas | .5 |
| 42. High intensity of land development | .5 |
| 46. Increasing intensity of adjacent land use | .5 |
| 50. Utilization of natural pleasing features of landscape | .5 |

Factor
loadingFactor Two (F2) - Health, Safety and Convenience

| | | |
|-----|--|----|
| 30. | Provision of general residential amenities (upkeep, services) | .8 |
| 48. | Unpolluted ground water supply | .8 |
| 2. | Protection against contagion | .7 |
| 11. | Provision of possibilities for reasonable aesthetic satisfaction | .7 |
| 16. | Nearness of home to recreation | .7 |
| 17. | Nearness of home to shopping | .7 |
| 18. | Nearness of home to health facilities | .7 |
| 21. | Nearness of home to religious facilities | .7 |
| 22. | Nearness of home to social facilities | .7 |
| 24. | Availability of sewerage | .7 |
| 39. | Minimum commuting expenses | .7 |
| 3. | Provision for maintenance of cleanliness | .6 |
| 10. | Protection against moral hazards | .6 |
| 12. | Nearness to land vehicular system | .6 |
| 28. | Separation from blighted areas (poverty, disease) | .6 |
| 43. | Good drainage characteristics of soil | .6 |
| 44. | Land not subject to flooding | .6 |
| 50. | Utilization of natural pleasing features of landscape | .6 |
| 55. | Convenient to streams of pedestrian traffic | .6 |
| 23. | Nearness of home to school facilities | .5 |
| 35. | Minimum local property taxes | .5 |
| 42. | High intensity of land development | .5 |
| 49. | Protective orientation with respect to prevailing winds | .5 |
| 60. | Minimum speculative subdivision of land | .5 |
| 63. | Variety and opportunity for choice in way of life | .5 |
| 64. | Freedom from ethnic conflict | .5 |
| 8. | Provision of adequate privacy | .4 |
| 20. | Nearness of retail to industrial areas | .4 |
| 62. | Diversification in industry | .4 |

SUB-PROBLEM LEVEL THREE - (Three Factor Solution)

| Factor One (F1) - <u>Money, Trade and Efficiency</u> | Factor Loading |
|---|----------------|
| 31. Maximum economic income from the land | .9 |
| 32. High assessed land value | .9 |
| 37. Maximum interest on capital invested in present and future improvements | .9 |
| 41. Large supply of competitive settlement land | .9 |
| 45. Low turnover of occupancy | .9 |
| 56. Maximum knowledge of change of patterns of value through time | .9 |
| 57. Maximum knowledge of use pattern change through time | .9 |
| 58. Maximum knowledge of "whims" of land owners | .9 |
| 59. Maximum knowledge of "whims" of land occupants | .9 |
| 61. Minimum land vehicular traffic congestion | .9 |
| 19. 'Nearness of storage (warehouses) to office and retail areas | .8 |
| 33. Strong competitive "pull" of the area | .8 |
| 34. Prospective investment In public improvements | .8 |
| 38. Maximum product sales potential at particular site. | .8 |
| 51. Ease of marketability of land titles | .8 |
| 52. Minimum anticipated risk in investment | .8 |
| 53. Minimum interest on borrowed money | .8 |
| 25. Availability of zoning protection | .7 |
| 35. Minimum local property taxes | .7 |
| 36. Nimum operating costs | .7 |
| 40. Minimum improvement costs | .7 |
| 15. Nearness of work to recreation | .6 |
| 43. Good drainage characteristics of soil | .6 |
| 44. Land not subject to flooding | .6 |
| 49. Protective orientation with respect to prevailing winds | .6 |
| 42. High intensity of land development | .5 |
| 46. Increasing intensity of adjacent land use | .5 |
| 50. Utilization of natural pleasing features of landscape | .5 |
| 20. Nearness of retail to industrial areas | .4 |

| Factor Two (F2) - <u>Convenience, Health and Land Characteristics</u> | Factor Loading |
|---|-------------------|
| 55. Convenient to streams of pedestrian traffic | .8 |
| 64. Freedom from ethnic conflict | .8 |
| 2. Protection against contagion | .7 |
| 12. Nearness to land vehicular system | .7 |
| 16. Nearness of home to recreation | .7 |
| 21. Nearness of home to religious facilities | .7 |
| 22. Nearness of home to social facilities | .7 |
| 39. Minimum commuting expenses | .7 |
| 42. High intensity of land development | .7 |
| 48. Unpolluted ground water supply | .7 |
| 49. Protective orientation with respect to prevailing winds | .7 |
| 17. Nearness of home to shopping | .6 |
| 30. Provision of general residential amenities (upkeep, services) | .6 |
| 43. Good drainage characteristics of soil | .6 |
| 44. Land not subject to flooding | .6 |
| 3. Provision for maintenance of cleanliness | .5 |
| 11. Provision of possibilities for reasonable aesthetic satisfaction | .5 |
| 35. Minimum local property taxes | .5 |
| 40. Minimum improvement costs | .5 |
| 50. Utilization of natural pleasing features of landscape | .5 |
| 62. Diversification in industry | .5 |
| 63. Variety and opportunity for choice in way of life | .5 |
| 24. Availability of sewerage | .4 |
| 28. Separation from blighted areas (poverty, disease) | .4 |

Factor Three (F3) - Health and Safety

| | |
|--|----|
| 18. Nearness of home to health facilities | .7 |
| 60. Minimum speculative subdivision of land | .7 |
| 10. Protection against moral hazards | .6 |
| 11. Provision of possibilities for reasonable aesthetic satisfaction | .6 |
| 14. Nearness of home to work | .6 |
| 24. Availability of sewerage | .6 |
| 17. Nearness of home to shopping | .5 |
| 30. Provision of general residential amenities (upkeep, services) | .5 |
| 3. Provision for maintenance of cleanliness | .4 |
| 9. Provision of opportunities for normal family and community life | .4 |

| | Factor Loading |
|--|-------------------|
| 23. Nearness of home to school facilities | .4 |
| 47. Decreasing intensity of adjacent land use | .4 |

SUB-PROBLEM LEVEL FIVE - (Five Factor Solution)

Factor One (F1) - Money, Trade and Efficiency

| | |
|---|----|
| 31. Maximum economic income from the land | .9 |
| 34. Prospective investment in public improvements | .9 |
| 37. Maximum interest on capital invested in present and future improvements | .9 |
| 41. Large supply of competitive settlement land | .9 |
| 45. Low turnover of Occupancy | .9 |
| 56. Maximum knowledge of change of patterns of value through time | .9 |
| 57. Maximum knowledge of use pattern change through time | .9 |
| 58. Maximum knowledge of "whims" of land owners | .9 |
| 59. Maximum knowledge of "whims" of land occupants | .9 |
| 61. Minimum land vehicular traffic congestion | .9 |
| 19. Nearness of storage (warehouses) to office and retail areas | .8 |
| 32. High assessed land value | .8 |
| 33. Strong competitive "pull" of the area | .8 |
| 38. Maximum product sales potential at particular site | .8 |
| 25. Availability of zoning protection | .7 |
| 36. Minimum operating costs | .7 |
| 51. Ease of marketability of land titles | .7 |
| 52. Minimum anticipated risk in investments | .7 |
| 53. Minimum interest on borrowed money | .7 |
| 15. Nearness of work to recreation | .6 |
| 35. Minimum local property taxes | .6 |
| 40. Minimum improvement costs | .6 |
| 43. Good drainage characteristics of soil | .5 |
| 44. Land not subject to flooding | .5 |
| 46. Increasing intensity of adjacent land use | .5 |
| 49. Protective orientation with respect to prevailing winds | .5 |
| 50. Utilization of natural pleasing features of landscape | .5 |

| Factor Two (F2) - <u>Convenience and Land Characteristics</u> | Factor Loading |
|---|-------------------|
| 49. Protective orientation with respect to prevailing winds | .7 |
| 40. Minimum improvement costs | .6 |
| 42. High intensity of land development | .6 |
| 65. Allowing "fringe" developments to occur | .6 |
| 12. Nearness to land vehicular system | .5 |
| 13. Nearness to water vehicular systems | .5 |
| 35. Minimum local property taxes | .5 |
| 43. Good drainage characteristics of soil | .5 |
| 44. Land not subject to flooding | .5 |
| 48. Unpolluted ground water supply | .5 |
| 51. Ease of marketability of land titles | .5 |
| 52. Minimum anticipated risk in investments | .5 |
| 53. Minimum interest on borrowed money | .5 |
| 62. Diversification in industry | .5 |
| 64. Freedom from ethnic conflict | .5 |

Factor Three (F3) - General Amenities

| | |
|--|----|
| 60. Minimum speculative subdivision of land | .8 |
| 9. Provision of opportunities for normal family and community life | .7 |
| 10. Protection against moral hazards | .6 |
| 18. Nearness of home to health facilities | .5 |
| 47. Decreasing intensity of land development | .5 |

Factor Four (F4) - Health and General Amenities

| | |
|---|----|
| 11. Provisions of possibilities for reasonable aesthetic satisfaction | .8 |
| 24. Availability of sewerage | .8 |
| 28. Separation from blighted areas (poverty, disease) | .7 |
| 30. Provision of general residential amenities (upkeep, services) | .7 |
| 50. Utilization of natural pleasing features of landscape | .7 |
| 3. Provision of maintenance of cleanliness | .6 |
| 4. Provision of adequate daylight, sunshine and ventilation | .6 |

| | Factor Loading |
|--|-------------------|
| 16. Nearness of home to recreation | .6 |
| 17. Nearness of home to shopping | .6 |
| 18. Nearness of home to health facilities | .6 |
| 21. Nearness of home to religious facilities | .6 |
| 8. Provision of adequate privacy | .5 |
| 12. Nearness to land vehicular system | .5 |
| 39. Minimum commuting expenses | .5 |
| 2. Protection against contagion | .4 |
| 10. Protection against moral hazards | .4 |
| 22. Nearness of home to social facilities | .4 |
| 23. Nearness of home to school facilities | .4 |
| 35. Minimum local property taxes | .4 |
| 48. Unpolluted ground water supply | .4 |

Factor Five (F5) - Convenience, Health and
Way of Life

| | |
|---|----|
| 2. Protection against contagion | .7 |
| 22. Nearness of home to social facilities | .7 |
| 55. Convenient to streams of pedestrian traffic | .7 |
| 63. Variety and opportunity for choice in way of life | .6 |
| 64. Freedom from ethnic conflict | .6 |
| 3. Provision for maintenance of cleanliness | .5 |
| 39. Minimum commuting expenses | .5 |
| 29. Proximity to mixed uses | .4 |
| 48. Unpolluted ground water supply | .4 |

SUB-PROBLEM LEVEL EIGHT - (Eight Factor Solution)

Factor One (F1)- Money and Land

| | |
|--|----|
| 31. Maximum economic Income from the land (capital gain) | .9 |
| 33. Strong competitive "pull" of the area | .9 |
| 34. Prospective investment in public improvements | .9 |
| 37. Maximum interest on capital invested in present and future improvements | .9 |
| 38. Maximum product sales potential at particular site | .9 |
| 41. Large supply of competitive settlement land | .9 |
| 45. Low turnover of occupancy | .9 |
| 56. Maximum knowledge of change of patterns of value through time | .9 |

| | Factor Loading |
|---|-------------------|
| 57. Maximum knowledge of use pattern change through time | .9 |
| 58. Maximum knowledge of "whims" of land owners | .9 |
| 59. Maximum knowledge of "whims" of land occupants | .9 |
| 19. Nearness of storage (warehouses) to office and retail areas | .8 |
| 32. High assessed land value | .8 |
| 61. Minimum land vehicular traffic congestion | .8 |
| 25. Availability of zoning protection | .7 |
| 36. Minimum Operating costs | .7 |
| 51. Ease of marketability of land titles | .7 |
| 52. Minimum anticipated risk in investments | .7 |
| 53. Minimum interest on borrowed money | .7 |
| 15. Nearness of work to recreation | .6 |
| 35. Minimum local property taxes | .6 |
| 40. Minimum improvement costs | .5 |
| 46. Increasing intensity of adjacent land use | .5 |
| 50. Utilization of natural pleasing Features of landscape | .5 |
| 43. Good drainage characteristics of soil | .4 |
| 44. Land not subject to flooding | .4 |

Factor Two (F2) - Convenience and Land Characteristics

| | |
|---|----|
| 43. Good drainage characteristics of soil | .8 |
| 44. Land not subject to flooding | .8 |
| 49. Protective orientation with respect to prevailing winds | .8 |
| 35. Minimum local property taxes | .7 |
| 40. Minimum improvement costs | .7 |
| 48. High intensity of land development | .7 |
| Unpolluted ground water supply | .7 |
| 12. Nearness to land vehicular system | .6 |
| 51. Ease of marketability of land titles | .6 |
| 52. Minimum anticipated risk in investment | .6 |
| 53. Minimum interest on borrowed money | .6 |
| 17. Nearness of home to shopping | .5 |
| 21. Nearness of home to religious facilities | .5 |
| 24. Availability of sewerage | .5 |
| 16. Nearness of home to recreation | .4 |

Factor Three (F3) - General Amenities

| | Factor Loading |
|--|----------------|
| 60. Minimum speculative subdivision of land | .8 |
| 9. Provision of opportunities for normal family and community life | .7 |
| 18. Nearness of home to health facilities | .7 |
| 10. Protection against moral hazards | .6 |
| 19. Nearness of storage (warehouses) to office and retail areas | .5 |
| 23. Nearness of home to school facilities | .5 |
| 47. Decreasing intensity of adjacent land use | .5 |
| 13. Nearness to water vehicular systems | .4 |

Factor Four (F4) - Health and Convenience

| | |
|---|----|
| 8. Provision of adequate privacy | .7 |
| 6. Protection against atmospheric pollution and offensive odors | .6 |
| 11. Provisions of possibilities for reasonable aesthetic satisfaction | .6 |
| 26. Proximity to same ethnic area | .6 |
| 28. Separation from blighted areas (poverty, disease) | .6 |
| 3. Provision for maintenance of cleanliness | .5 |
| 4. Provision of adequate daylight, sunshine and ventilation | .5 |
| 14. Nearness of home to work | .5 |
| 24. Availability of sewerage | .5 |
| 50. Utilization of natural pleasing features of landscape | .5 |
| 12. Nearness to land vehicular system | .4 |
| 17. Nearness of home to shopping | .4 |
| 18. Nearness of home to health facilities | .4 |

Factor Five (F5) - Health and Convenience

| | |
|---|----|
| 39. Minimum commuting expenses | .7 |
| 2. Protection against contagion | .6 |
| 48. Unpolluted ground water supply | .6 |
| 63. Variety and opportunity for choice in way of life | .6 |
| 22. Nearness of home to social facilities | .5 |

| | Factor Loading |
|---|-------------------|
| 3. Provision for maintenance Of cleanliness | .4 |
| 55. Convenient to streams of pedestrian traffic | .4 |
| 60. Minimum speculative subdivision Of land | .4 |

Factor Six (F6) - Protection and Work

| | |
|---|----|
| 5. Protection against excessive noise | .8 |
| 7. Provision from fatigue | .8 |
| 20. Nearness of retail to industrial areas | .7 |
| 1. Protection against accidents and hazards | .5 |
| 14. Nearness of home to work | .5 |

Factor Seven (F7) - Convenience

| | |
|--|----|
| 23. Nearness of home to school facilities | .7 |
| 3. Provision for maintenance of cleanliness | .6 |
| 16. Nearness of home to recreation | .6 |
| 21. Nearness of home to religious facilities | .6 |
| 22. Nearness of home to social facilities | .6 |
| 30. Provision of general residential amenities (upkeep, services) | .6 |
| 2. Protection against contagion | .5 |
| 42. High intensity of land development | .5 |
| 55. Convenient to streams of pedestrian traffic | .5 |
| 64. Freedom from ethnic conflict | .5 |
| 4. Provision of adequate daylight, sunshine and ventilation | .4 |
| 46. Increasing intensity of adjacent land use | .4 |

Factor Eight (F8) - Convenience and Way of Life

| | |
|---|----|
| 65. Allowing "fringe" developments to occur | .8 |
| 13. Nearness to water vehicular systems | .6 |
| 55. Convenient to streams of pedestrian traffic | .6 |
| 62. Diversification in industry | .6 |
| 64. Freedom from ethnic conflict | .6 |
| 63. Variety and opportunity for choice in way of life | .4 |

SUB-PROBLEM LEVEL TEN - (Ten Factor Solution)Factor One (F1) - Money&Trade and Efficiency

| | Factor Loading |
|---|-------------------|
| 31. Maximum economic income from the land | .9 |
| 34. Prospective investment in public improvements | .9 |
| 37. Maximum interest on capital invested in present and future improvements | .9 |
| 41. Large supply of competitive settlement land | .9 |
| 45. Low turnover of occupancy | .9 |
| 56. Maximum knowledge of change of patterns of value through time | .9 |
| 57. Maximum knowledge of use pattern change through time | .9 |
| 58. Maximum knowledge of "whims" of land owners | .9 |
| 59. Maximum knowledge of "whims" Of land occupants | .9 |
| 32. High assessed land value | .8 |
| 33. Strong competitive "pull" of the area | .8 |
| 38. Maximum product sales potential at particular site | .8 |
| 61. Minimum land vehicular traffic congestion | .8 |
| 36. Minimum operating costs | .7 |
| 19. Nearness of storage (warehouses) to office and retail areas | .6 |
| 25. Availability of zoning protection | .6 |
| 51. Ease of marketability of land titles | .6 |
| 52. Minimum anticipated risk in investments | .6 |
| 53. Minimum interest on borrowed money | .6 |
| 15. Nearness of work to recreation | .5 |
| 35. Minimum local property taxes | .5 |
| 40. Minimum improvement costs | .5 |
| 50. Utilization of natural pleasing features of landscape | .5 |
| 43. Good drainage characteristics of soil | .4 |
| 44. Land not subject to flooding | .4 |
| 46. Increasing intensity of adjacent land use | .4 |

Factor Two (F2) - Health and Convenience

| | |
|---|----|
| 2. Protection against contagion | .8 |
| 55. Convenient to streams Of pedestrian traffic | .7 |
| 3. Provision for maintenance of cleanliness | .6 |
| 22. Nearness of home to social facilities | .6 |
| 39. Minimum commuting expenses | .6 |
| 64. Freedom from ethnic conflict | .6 |
| 1. Protection against accidents and hazards | .5 |
| 63. Variety and opportunity for choice in way of life | .4 |

Factor Three (F3) - Land Development Patterns

| | Factor Loading |
|---|-------------------|
| 60. Minimum speculative subdivision of land | .8 |
| 47. Decreasing intensity of adjacent land use | .7 |
| 14. Nearness of home to work | .4 |

Factor Four (F4) - Convenience and Way of Life

| | |
|---|----|
| 65. Allowing "fringe" developments to occur | .8 |
| 13. Newness to water vehicular systems | .6 |
| 62. Diversification in industry | .6 |
| 55. Convenient to streams of pedestrian traffic | .4 |
| 64. Freedom from ethnic conflict | .4 |

Factor Five (F5) - Health and Convenience

| | |
|--|----|
| 11. Provision of possibilities for reasonable aesthetic satisfaction | .7 |
| 26. Proximity to same ethnic area | .7 |
| 28. Separation from blighted areas (poverty, disease) | .7 |
| 6. Protection against atmospheric pollution and offensive odors | .6 |
| 8. Provision of adequate privacy | .6 |
| 3. Provision for maintenance of cleanliness | .5 |
| 4. Provision of adequate daylight, sunshine and ventilation | .5 |
| 24. Availability of sewerage | .5 |
| 50. Utilization of natural pleasing features of landscape | .5 |
| 14. Nearness of home to work | .4 |
| 17. Nearness of home to shopping | .4 |
| 18. Nearness of home to health facilities | .4 |

Factor Six (F6) - Protection and Work

| | |
|---------------------------------------|----|
| 5. Protection against excessive noise | .8 |
| 7. Provision From fatigue | .8 |

| | Factor Loading |
|---|-------------------|
| 20. Nearness Of retail to industrial areas | .7 |
| 14. Newness of home to work | .5 |
| 1. Protection against accidents and hazards | .4 |

Factor Seven- (F7) - Convenience

| | |
|--|----|
| 23. Nearness of home to school facilities | .8 |
| 16. Nearness of home to recreation | .7 |
| 21. Nearness Of home to religious facilities | .7 |
| 30. Provision of general residential amenities (upkeep, services) | .7 |
| 18. Nearness of home to health facilities | .6 |
| 17. Nearness of home to shopping | .5 |
| 42. High intensity of land development | .5 |
| 3. Provision for maintenance of cleanliness | .4 |

Factor Eight (F8)- Convenience and Land Characteristics

| | |
|--|----|
| 43. Good drainage characteristics of soil | .9 |
| 44. Land not subject to flooding | .9 |
| 48. Unpolluted ground water supply | .8 |
| 49. Protective orientation with respect to prevailing winds | .8 |
| 42. High intensity of land development | .6 |
| 12. Nearness to land vehicular system | .5 |
| 17. Nearness of home to shopping | .5 |
| 35. Minimum local property taxes | .5 |
| 39. Minimum commuting expenses | .5 |
| 40. Minimum improvement costs | .5 |
| 24. Availability of sewerage | .4 |

Factor Nine (F9)- Normal Life

| | |
|---|----|
| 9. Provision of opportunities for normal family and community life | .8 |
|---|----|

Factor
Loading

10. Protection against moral hazards

.7

Factor Ten (F10) - Minimum Economic Expenditure

51. Ease of marketability of land titles

.6

52. Minimum anticipated risk in Investments

.6

53. Minimum interest on borrowed money

.6

40. Minimum Improvement costs

.5

54. Maximum interest on loaned money

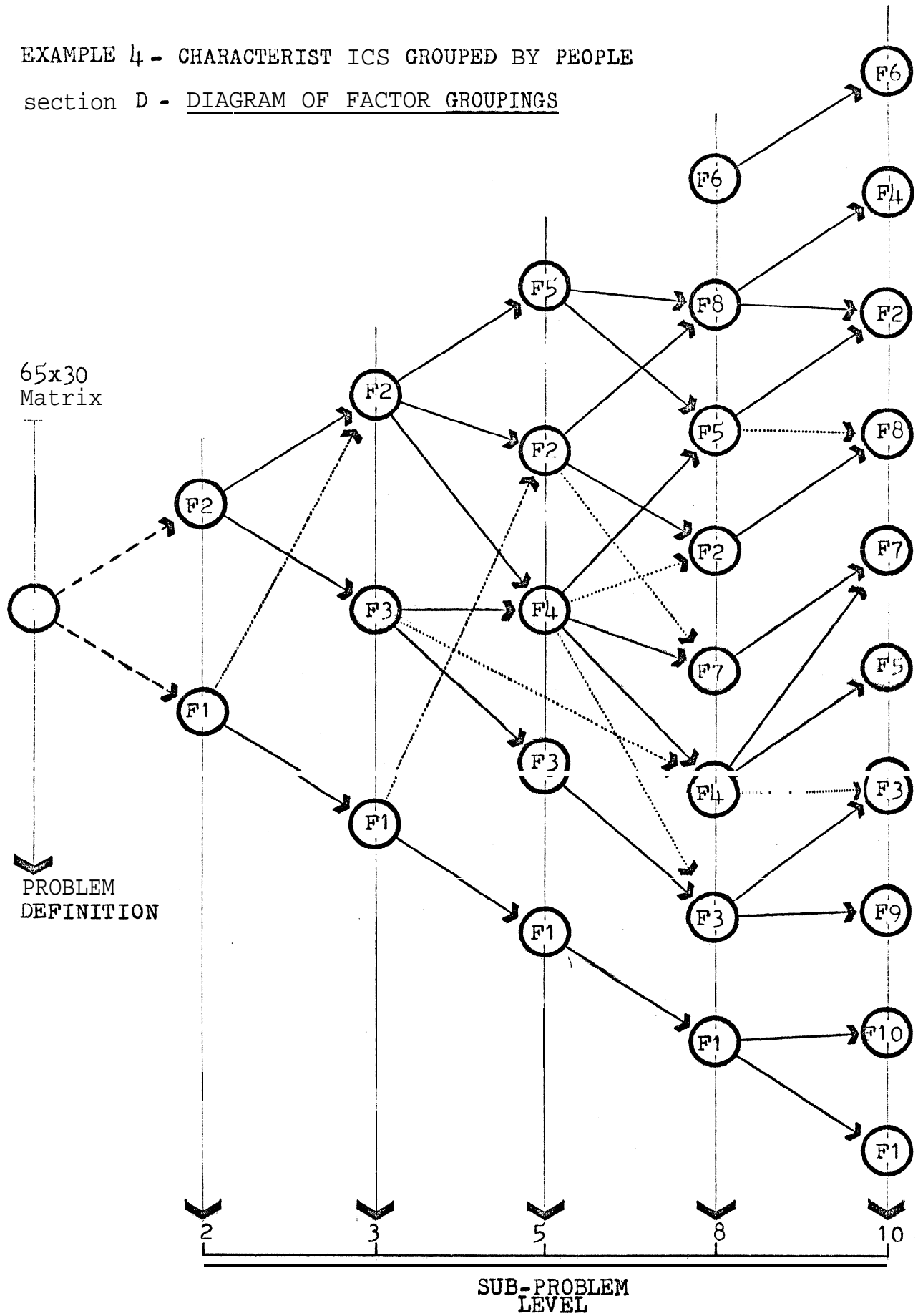
.5

35. Minimum local property taxes

.4

EXAMPLE 4 - CHARACTERIST ICS GROUPED BY PEOPLE

section D - DIAGRAM OF FACTOR GROUPINGS



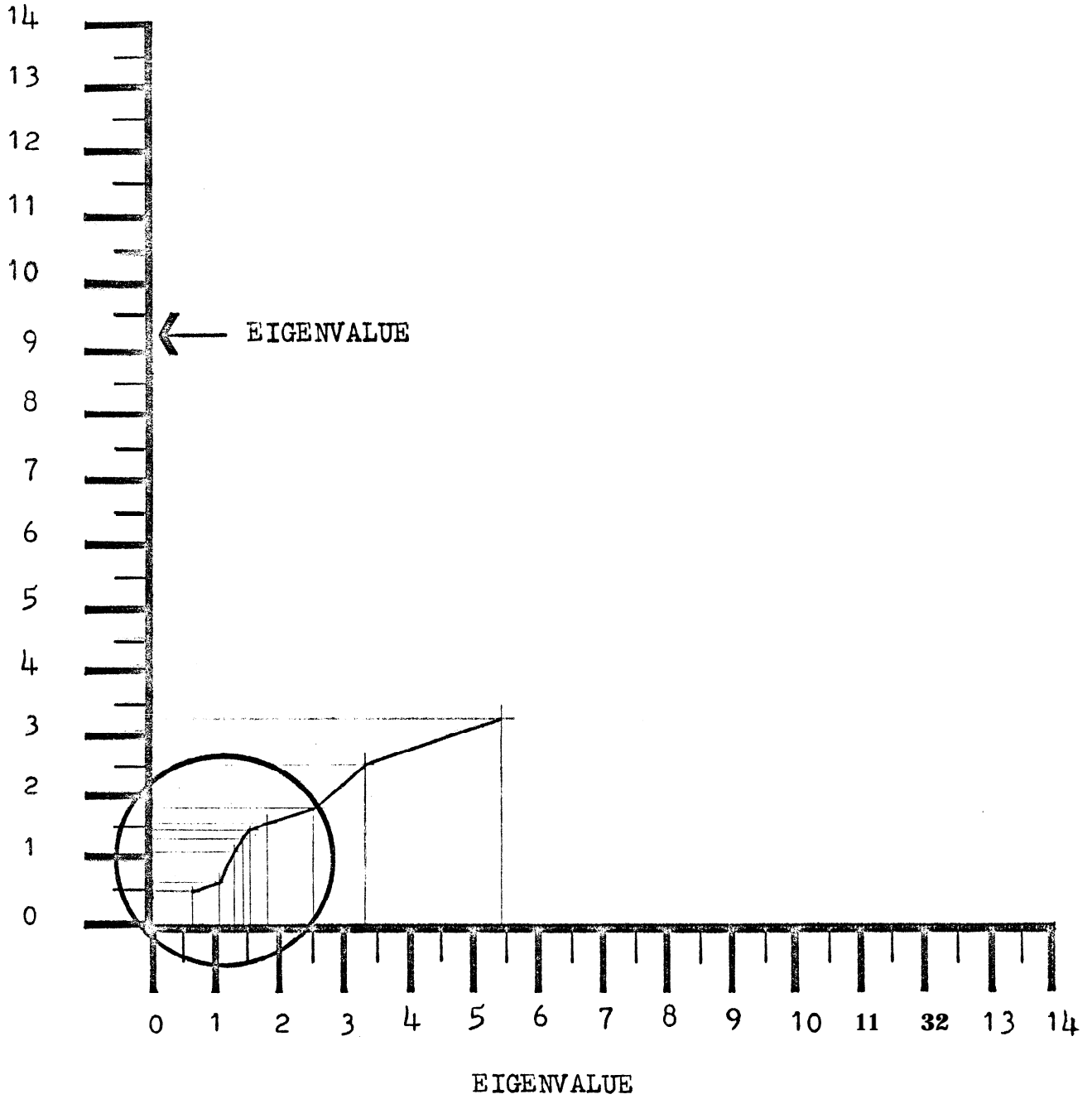
APPENDIX FIVE

EXAMPLE 5 - PEOPLE GROUPED BY PEOPLESection A - LIST OF 30 COMPONENTS

1. Children **0-16 of** local families
2. Children **0-16 of** non-local families
3. Native girls 16-21
4. Native boys 16-21
5. White girls 16-21
6. White boys 16-21
7. Unmarried native women (over 21)
8. Unmarried native men (over 21)
9. Unmarried permanent white women
10. Unmarried permanent white men
11. Unmarried transient white women
12. Unmarried transient white men
13. Local married native couples
14. Non-local married native couples
15. Married permanent white couples
16. Married transient white couples.
17. Trades labor
18. Skilled labor
19. Unskilled labor
20. Managerial and professional employment
21. Self-employed as owner/manager
22. Self-employed as harvester of natural resources
23. Unemployment
24. Gainful employment in home
25. "Employment" as vocational student
26. Membership in educational clubs/associations
27. Membership in community and service clubs/associations
28. Membership in occupational clubs/associations
29. Membership in religious groups
30. Membership in recreational clubs/associations

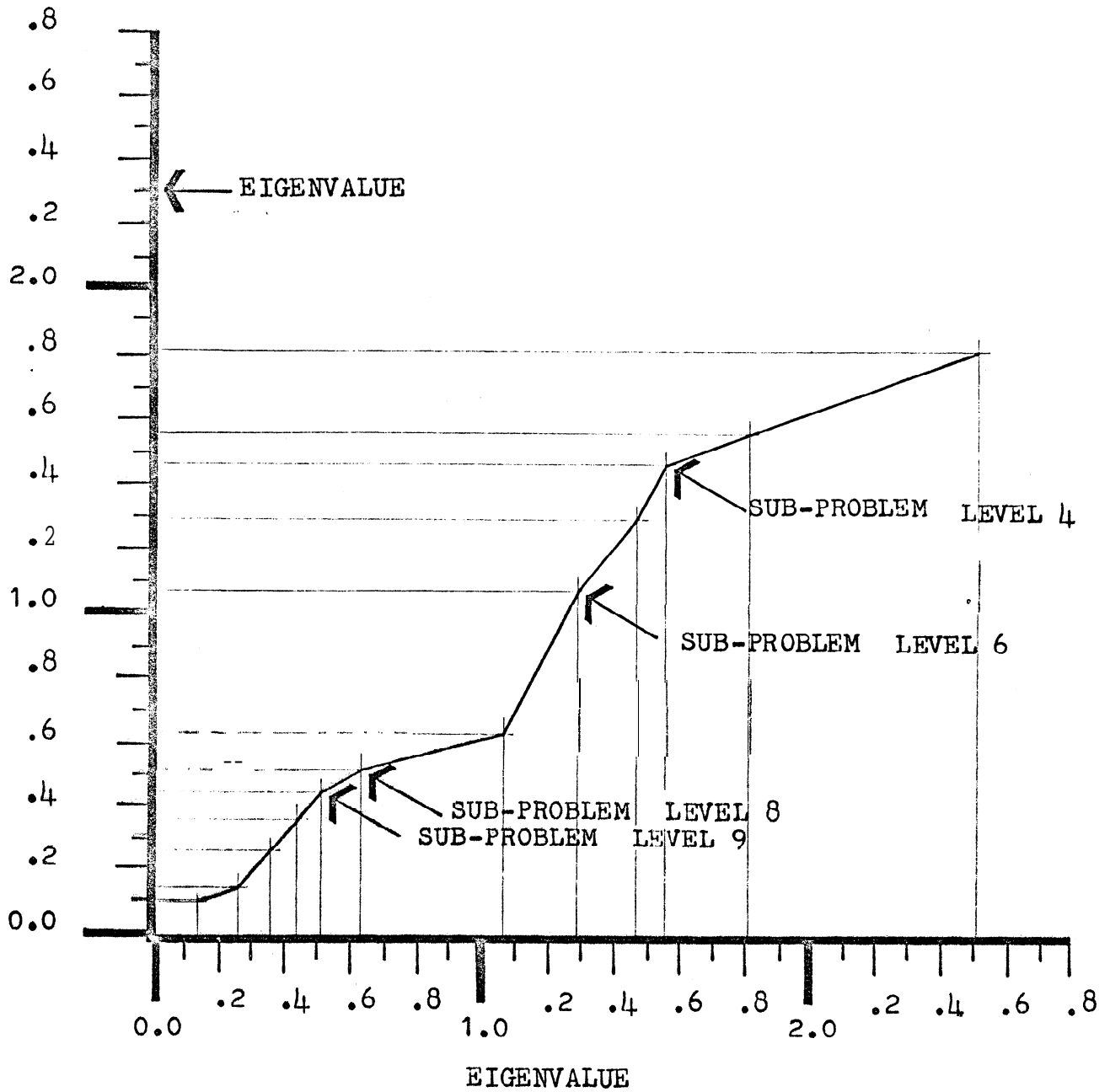
EXAMPLE 5 - PEOPLE GROUPED BY PEOPLE

Section B - GRAPH OF EIGENVALUES



EXAMPLE 5 - PEOPLE GROUPED BY PEOPLE

Section B - EIGENVALUES (CONT'D)



EXAMPLE 5

Section C - FACTOR BREAKDOWNSSUB-PROBLEM LEVEL TWO - (Two Factor Solution)Factor One (F1) - Children and Natives

| | Factor Loading |
|--|-------------------|
| 1. Children 0-16 of local families | .6 |
| 2. Children 0-16 of non-local families | .6 |
| 3. Native girls 16-21 | .6 |
| 4. Native boys 16-21 | .6 |
| 8. Unmarried native men (over 21) | .6 |
| 14. Non-local married native couples | .6 |
| 7. Unmarried native women (over 21) | .5 |
| 13. Local married native couples | .5 |
| 19. Unskilled labor | .5 |
| 23. Unemployment | .5 |

Factor Two (F2) - White and Labor

| | |
|---|----|
| 6. White boys 16-21 | .7 |
| 5. White girls 16-21 | .6 |
| 9. Unmarried permanent white women | .5 |
| 11. Unmarried transient white women | .5 |
| 16. Married transient white couples | .5 |
| 17. Trades labor | .5 |
| 18. Skilled labor | .5 |
| 30. Membership in recreational clubs/associations | .4 |

SUB-PROBLEM FOUR - (Four Factor Solution)Factor One (F1) - Owner, Manager, Professional
and Club Membership

| | |
|--|----|
| 21. Self-employed as owner/manager | .8 |
| 20. Managerial and professional employment | .7 |
| 28. Membership in occupational clubs/associations | .7 |
| 27. Membership in community and service clubs/ associations | .6 |
| 26. Membership in educational clubs/associations | .4 |

Factor Two (F2) - White YouthsFactor
Loading

| | | |
|-----|---|----|
| 5. | White girls 16-21 | .8 |
| 6. | White boys 16-21 | .8 |
| 18. | Skilled labor | .6 |
| 30. | Membership in recreational clubs/associations | .6 |
| 17. | Trades labor | .5 |
| 29. | Membership in religious groups | .5 |

Factor Three (F3) - Children and Natives

| | | |
|-----|----------------------------------|----|
| 7. | Unmarried native women (over 21) | .8 |
| 3. | Native girls 16-21 | .7 |
| 8. | Unmarried native men (over 21) | .7 |
| 4. | Native boys 16-21 | .6 |
| 19. | Unskilled labor | .6 |
| 23. | Unemployment | .6 |
| 1. | Children 0-16 of local families | .5 |
| 13. | Local married native couples | .5 |

Factor Four (F4) - Children and Whites

| | | |
|-----|-------------------------------------|----|
| 16. | Married transient white couples | .7 |
| 9. | Unmarried permanent white women | .6 |
| 10. | Unmarried permanent white men | .6 |
| 1. | Children 0-16 of local families | .5 |
| 2. | Children 0-16 of non-local families | .5 |
| 11. | Unmarried transient white women | .5 |
| 15. | Married permanent white couples | .5 |

SUB-PROBLEM LEVEL SIX - (Six Factor Solution)Factor One (F1) - Children and Natives

| | | |
|-----|--|----|
| 7. | Unmarried native women (over 21) | .8 |
| 8. | Unmarried native men (over 21) | .8 |
| 3. | Native girls 16-21 | .7 |
| 23. | Unemployment | .7 |

| | Factor Loading |
|------------------------------------|-------------------|
| 19. Unskilled labor | .6 |
| 4. Native boys 16-21 | .5 |
| 1. Children 0-16 of local families | .4 |
| 13. Local married native couples | .4 |

Factor Two (F2) - Children, White Youths (Girls)
and Clubs

| | |
|--|----|
| 1. Children 0-16 of local families | .6 |
| 5. White girls 16-21 | .6 |
| 29. Membership in religious groups | .6 |
| 30. Membership in recreational clubs/ associations | .6 |
| 2. Children 0-16 of non-local families | .5 |

Factor Three (F3) - Owner, Manager, Professional
and Club Membership

| | |
|--|----|
| 21. Self-employed as owner/manager | .8 |
| 20. Managerial and professional employment | .7 |
| 27. Membership in community and service clubs/ associations | .7 |
| 28. Membership in occupational clubs/associations | .6 |
| 26. Membership in educational clubs/associations | .5 |

Factor Four (F4) - White Women and Transient
White Couples

| | |
|-------------------------------------|----|
| 9. Unmarried permanent white women | .8 |
| 11. Unmarried transient white women | .7 |
| 16. Married transient white couples | .7 |

Factor Five (F5) - White Men and Couples (Permanent)

| | |
|-------------------------------------|----|
| 10. Unmarried permanent white men | .7 |
| 15. Married permanent white couples | .7 |

Factor Six (F6) - White Youths

| | Factor\ Loading |
|-----------------------------------|--------------------|
| 6. White boys 16-21 | .7 |
| 18. Skilled labor | .7 |
| 5. White girls 16-21 | .5 |
| 12. Unmarried transient white men | .5 |
| 17. Trades labor | .5 |

SUB-PROBLEM LEVEL EIGHT - (Eight Factor Solution)Factor One (F1) - Youths and Unmarried (Native)

| | |
|-------------------------------------|----|
| 7. Unmarried native women (over 21) | .8 |
| 8. Unmarried native men (over 21) | .7 |
| 3. Native girls 16-21 | .6 |
| 19. Unskilled labor | .6 |
| 23. Unemployment | .6 |
| 4. Native boys 16-21 | .4 |

Factor Two (F2) - Children

| | |
|--|----|
| 1. Children 0-16 of local families | .8 |
| 2. Children 0-16 Of non-local families | .8 |
| 29. Membership in religious groups | .4 |

Factor Three (F3)- Owner, Manager, Professional
and Club Membership

| | |
|--|----|
| 21. Self-employed as owner/manager | .8 |
| 20. Managerial and professional employment | .7 |
| 27. Membership in community and service clubs/ associations | .7 |
| 28. Membership in occupational clubs/associations | .6 |
| 26. Membership in educational clubs/associations | .5 |

Factor Four (F4) - White Women and Transient
White Couples Factor
Loading

| | | |
|-----|---------------------------------|----|
| 9. | Unmarried permanent white women | .8 |
| 11. | Unmarried transient white women | .7 |
| 16. | Married transient white couples | .7 |

Factor Five (F5) - Permanent and Transient Whites

| | | |
|-----|---------------------------------|----|
| 10. | Unmarried permanent white men | .7 |
| 15. | Married permanent white couples | .7 |
| 12. | Unmarried transient white men | .5 |

Factor Six (F6) - White Youths

| | | |
|-----|---|----|
| 6. | White boys 16-21 | .8 |
| 5. | White girls 16-21 | .7 |
| 18. | Skilled labor | .5 |
| 30. | Membership in recreational clubs/associations | .5 |

Factor Seven (F7) - Vocational Student

| | | |
|-----|------------------------------------|----|
| 25. | "Employment" as vocational student | .7 |
|-----|------------------------------------|----|

Factor Eight (F8) - Native Couples and
Native Youths (Boys)

| | | |
|-----|----------------------------------|----|
| 13. | Local married native couples | .7 |
| 14. | Non-local married native couples | .6 |
| 4. | Native boys 16-21 | .4 |

SUB-PROBLEM LEVEL NINE - (Nine Factor Solution)

| <u>Factor One (F1) - Youths, Unmarried Natives and Unemployment</u> | | Factor Loading |
|---|--|-------------------|
| 7. | Unmarried native women (over 21) | .9 |
| 3. | Native girls 16-21 | .7 |
| 23. | Unemployment | .7 |
| 8. | Unmarried native men (over 21) | .5 |
| 19. | Unskilled labor | .5 |
| | | |
| <u>Factor Two (F2) - Children, White Youths (Girls) and Clubs</u> | | |
| 1. | Children 0-16 of local families | .6 |
| 2. | Children 0-16 of non-local families | .6 |
| 5. | White girls 16-21 | .6 |
| 29. | Membership in religious groups | .6 |
| 30. | Membership in recreational clubs/associations | .5 |
| | | |
| <u>Factor Three (F3) - Owner, Manager, Professional and Club Membership</u> | | |
| 20. | Managerial and professional employment | .8 |
| 21. | Self-employed as owner/manager | .8 |
| 27. | Membership in community and service clubs/ associations | .7 |
| 28. | Membership in occupational clubs/associations | .6 |
| 26. | Membership in educational clubs/associations | .4 |
| | | |
| <u>Factor Four (F4) - White Women and Transient White Couples</u> | | |
| 9. | Unmarried permanent white women | .8 |
| 11. | Unmarried transient white women | .7 |
| 16. | Harried transient white couples | .7 |

Factor Five (F5) - Permanent and Transient Whites Factor
Loading

| | | |
|-----|---------------------------------|----|
| 15. | Married permanent white couples | .8 |
| 10. | Unmarried permanent white men | .7 |
| 12. | Unmarried transient white men | .5 |

Factor Six (F6) - White Youths

| | | |
|-----|-------------------------------|----|
| 6. | White boys 16-21 | .7 |
| 18. | Skilled labor | .6 |
| 5. | White girls 16-21 | .5 |
| 12. | Unmarried transient white men | .5 |
| 17. | Trades labor | .5 |
| 19. | Unskilled labor | .4 |

Factor Seven (F7) - Vocational Student

| | | |
|-----|------------------------------------|----|
| 25. | "Employment" as vocational student | .7 |
|-----|------------------------------------|----|

Factor Eight (F8) - Native Couples and Youths (Boys)

| | | |
|-----|----------------------------------|----|
| 13. | Local married native couples | .7 |
| 14. | Non-local married native couples | .6 |
| 4. | Native boys 16-21 | .4 |
| 8. | Unmarried native men (over 21) | .4 |

Factor Nine (F9) - Unmarried Native Men

| | | |
|-----|---|----|
| 8. | Unmarried native men (over 21) | .6 |
| 19. | Unskilled labor | .5 |
| 23. | Self-employed as harvester of natural resources | .5 |

EXAMPLE 5 - PEOPLE GROUPED BY PEOPLE

Section D - DIAGRAM OF FACTOR GROUPINGS

