THE RELATIONSHIP OF KNOWLEDGE OF THE URBAN PHYSICAL ENVIRONMENT AND SATISFACTION WITH THE URBAN ENVIRONMENT

by

MICHAEL E. HUNT

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Approved by:

Paul Windley

Major Professor

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TABLE OF CONTENTS

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LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

THE NATURE OF THE PROBLEM

Introduction

The purpose of this study is to determine if knowledge of the urban physical environment can be used as a partial predictor of satisfaction with one's urban environment.

The possible relationship between knowledge and satisfaction emerges from the many studies concerning mental maps, cognitive maps, and spatial (or environmental) images. All of these terms refer to cognitive representations of attributes of the spatial environment. No matter what the author of a particular study calls the cognitive representation, it seems to be implied that humans use mental maps to make sense of their surroundings and are satisfied when they succeed and distressed if difficulties arise.

Since the term knowledge is used here in the context of how well one perceives and knows the physical environment, a definition of environmental perception is necessary. "Environmental perception is the cognitive structuring of the physical and social environment in which the actual or objective world is replaced by a simpler, subjectively perceived environment. Mental filtering and coding of sensory data are necessary since it is impossible for the human brain to comprehend total reality."[1] This process results in the orientation, comfort, and movement of man through the environment. Several avenues have been used by researchers to discover ways to

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[1] D. C. D. Pocock, "City of the Mind," Scottish Geographical Magazine, Vol. 88, No. 2, Sept., 1972, p. 115.

make perception of the environment, and thus knowledge of it, easier and more efficient in an effort to make the individual more comfortable in the environment. Kevin Lynch calls this feeling a sense of emotional security (Lynch, 1960).

In his article, "Cognitive Maps in Perception and Thought," Stephen Kaplan argues that there are four major types of knowledge; recognition, prediction, evaluation, and action. The recognition, or where one is, phase entails the identification of one's current situation and also provides a basis for dealing with the problem of predicting. In the prediction phase, one determines what is likely to happen next. Prediction requires the identification of future situations and an estimation of the relative probabilities of occurrence. The evaluation phase determines whether the situation will be good or bad. And finally, possible courses of action are determined. Kaplan argues that these four types of knowledge are included in one's mental maps.

The four types of knowledge just discussed imply a process on which individuals are dependent. Satisfaction results if information passes through this process easily and smoothly. Kaplan's explanation is as follows.

> The process that feels good is the process that is most adaptive from an evolutionary point of view, that is, going along making sense out of things, anticipating, acting appropriately, and exploring new things. These activities have in common a focus on knowledge, on the acquisition, maintenance, and use of an individual's cognitive map of the environment.[2]

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[2]Stephen Kaplan, "Cognitive Maps, Human Needs and the Designed Environment," Proceedings of the Environmental Design Research Association Conference, Number 4, Vol. 1, p. 278.

Kevin Lynch has written much about the subject of mental maps, or environmental images as he refers to them. "Lynch argues that the image is used to interpret information; to guide action; to serve as a broad frame of reference within which a person can organize activity, belief, and knowledge; to serve as a basis for individual growth; and to give a sense of emotional security."[3] Purposeful mobility is the original function of the environmental image.

In "Some References to Orientation," Lynch cites several examples of the effects caused by the loss of the ability to organize one's surroundings. Cases of men who, through brain injury, have lost said ability can speak and think rationally as well as recognize objects in the environment, but they cannot structure their images into any connected system. These men were not able to find their own rooms after leaving them without assistance (Colucci, 1902; Marie and Behague, 1919; Paterson and Zongwill, 1945).

Lynch argues further that humans sense a degree of terror if they become convinced they are lost in their surroundings. He cites the following examples.

> Jaccard (1932) quotes an incident of native Africans who became disoriented. They were stricken with panic and plunged wildly into the bush. Witkin (1949) tells of an experienced pilot who lost his orientation to the vertical, and who described it as the most terrifying experience of his life. Many other writers (Binett, 1894; Peterson, 1916; Trowbridge, 1931), in describing the phenomenon of temporary disorientation in the modern city, speak of the accompanying emotions of distress.[4]

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[3]Stephen Kaplan, "Cognitive Representations," Image and Environment, eds. R. M. Downs and D. Stea (Aldine Publishing Co., 1973), p. 79.

[4]Kevin Lynch, "Some References to Orientation," Image and Environment, eds. R. M. Downs and D. Stea (Aldine Publishing Co., 1973), p. 302.

Other researchers in the field of environmental perception who agree with the previously discussed authors are many in number. In the article "Why Buildings are Known," Donald Appleyard argues that knowledge of the urban environment affects one's expectations and satisfactions, as well as one's actions and choices. In the article "The Mental Image of Architecture," Charles Burnette contends that in order to function at a place in a room, in a building, or in a city, we depend on mental images of these environments.

A synthesis of this information about environmental perception reveals that humans rely on mental maps to function in and move about in the environment and also that mental maps are made of and serve to structure one's urban knowledge. Mental maps are themselves made up of four kinds of knowledge: recognition, prediction, evaluation, and action. Furthermore, individuals gain a sense of emotional security or satisfaction if they possess a good environmental image and discomfort and distress if the opposite is true. There seems, therefore, to be a logical connection between knowledge and satisfaction. The question asked in this study is whether or not this satisfaction extends to the environment in question. In other words, is there a relation between knowledge of the physical environment and satisfaction with that environment as a whole?

Definition of Variables

Knowledge of the urban physical environment is that knowledge which allows the individual purposeful mobility within the city. Purposeful mobility entails the recognition of where one is in the city, the ability to predict what will happen next, the evaluation of whether this action will be good or bad, and the action itself.

Satisfaction with the urban environment is the extent to which an

individual is pleased with the city in which he or she lives.

Investigation

It is the hypothesis of this study that knowledge of the urban physical environment may be used as a partial predictor of satisfaction with one's urban environment. The study was conducted in Manhattan, Kansas, which is located in north central Kansas and has a population of 27,000.

A random sample (N = 43) was selected from the 1973 census listing of the entire city of Manhattan. The only restriction placed on the selection of the sample was the minimum age of 15.

The following control variables were used: sex; age; race; education; length of residence in the city; marital status; employment status; and income.

CHAPTER 2

MEASUREMENT

Knowledge of the Physical Environment

Knowledge of the physical environment is measured with the use of mental maps drawn by each respondent. The rationale for the use of mental maps as a measuring device stems from past studies which have demonstrated that knowledge of the environment is needed to formulate one's mental map and that the mental map is the structure that organizes one's activities, beliefs, and knowledge. Furthermore, mental maps illustrate spatial relationships which are very difficult to verbalize.

Problems arise when the attempt is made to objectively measure mental maps, which are in themselves subjective responses. In order to arrive at an objective method of measurement, specific dimensions of mental maps which may be measured objectively need to be determined.

In his book The Image of the City, Kevin Lynch discusses what he found to be the main distinctions between various individual mental maps; density and structural quality. Density refers to the extent to which a mental map is packed with detail and structural quality refers to the manner in which parts of the mental map are arranged and interrelated.

Donald Appleyard, in "Styles and Methods of Structuring a City," observed that mental maps can be grouped along two dimensions; type of elements predominantly used and the level of accuracy. Accuracy is defined by Appleyard as the mental map's congruence with the objective plan of the city. Appleyard's phrase, the type of element predominantly used, refers to the finding that mental maps used either sequential elements, spatial elements,

or both. "In the sequential maps the parts were more obviously connected, and the connections were dominant. In the spatial element maps, parts were quite often scattered over the map and connections were apparently incidental."[5] "The most accomplished maps employed combinations of both elements."[6] It is apparent from these definitions of spatial and sequential maps that structure is being considered simultaneously with elements used.

The results of the two studies discussed above seem to imply that there are three specific dimensions by which a mental map may indicate knowledge of the physical environment. Density and accuracy are either mentioned or implied by both authors as measures of knowledge. Lynch categorizes structural quality into four levels of increasing structural precision. Appleyard speaks of spatial and sequential maps but makes no argument that one requires an individual to possess more knowledge of the environment than the other. Within the two classifications of spatial and sequential maps, however, Appleyard has four levels of increasing structural quality which are somewhat similar to Lynch's. Both authors, therefore, also consider structural quality to be an important dimension of the mental map. The operational definition used in this study of knowledge of the physical environment is derived from these research results of Lynch and Appleyard.

Operational Definition of Knowledge of the Environment

Knowledge of the physical environment is operationally defined by measuring the density, accuracy, and structural quality of each respondent's

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[5]Donald Appleyard, "Styles and Methods of Structuring a City," Environment and Behavior, Vol. 2, No. 1, June, 1970, p. 103.

[6]Ibid.

mental map of Manhattan, Kansas. These three specific dimensions of mental maps to be used in this study now need to be further defined.

Density. Density is operationally defined by literally counting the number of paths, edges, districts, nodes, and landmarks that each mental map contains. These five elements were derived by Kevin Lynch and his definitions of them follow.

> Paths. Paths are the channels along which the observer customarily, occasionally, or potentially moves. They may be streets, walkways, transit lines, canals, railroads.
> Edges. Edges are the linear elements not used or considered as paths by the observer. They are the boundaries between two phases, linear breaks in continuity: shores, railroad cuts, edges of development, walls.
> Districts. Districts are the medium-to-large sections of the city, conceived of as having two-dimensional extent, which the observer mentally enters "inside of," and which are recognizable as having some common, identifying character. Always identifiable from the inside, they are also used for exterior reference if visible from the outside.
> Nodes. Nodes are points, the strategic spots in a city into which an observer can enter, and which are the intensive foci to and from which he is travelling.
> Landmarks. Landmarks are another type of point-reference, but in this case the observer does not enter within them, they are external. They are usually a rather simply defined physical object: building, sign, store, or mountain.[7]

The density measure is the summation of all the elements defined above, since this study is not concerned with the number of each individual type of element included in a map.

Structural Quality. Structural quality is measured by placing each mental map into one of four categories which are ranked on a continuum of increasing structural precision. The categories are defined and ranked as follows.

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[7]Kevin Lynch, Image of the City (MIT Press, 1960), p. 47.

(1) Elements are free; there is no structure or interrelations between parts.[8]
(2) Parts are roughly related in terms of general directions and relative distance but are haphazard and disjoint.
(3) Schematic sketch that shows a basic understanding of the structure of the city but tends to show paths in a relatively parallel and perpendicular fashion, thus avoiding the complexity of bends and unparallel directions of roads.
(4) More complete road system and relatively accurate spatial distributions that represent a fairly accurate representation of the structure of the city.

The above four categories were derived from the research conducted by Lynch and Appleyard. The concept of categories 1 and 2 are borrowed from Lynch's book, The Image of the City. Categories 3 and 4 are similar to Lynch's, who refers to category 3 as flexible structure and category 4 as rigid structure. In the article "Styles and Methods of Structuring a City," Appleyard presents categories of structure and precision that are very similar in nature to the categories presented in this paper. The main difference lies in the fact that Appleyard's definitions were derived by a study of Ciudad Guayana, while the definitions used in this study are more general in nature.

In order to further explain the four categories of structural quality, examples of mental maps that represent these categories will follow. Figure 1 illustrates an objective map of Manhattan. The streets that appear most often on the mental maps are darkened to illustrate the basic structure of the city. Since none of the mental maps received in this study were classified in category 1, an example is impossible.

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[8] Ibid., p. 88.

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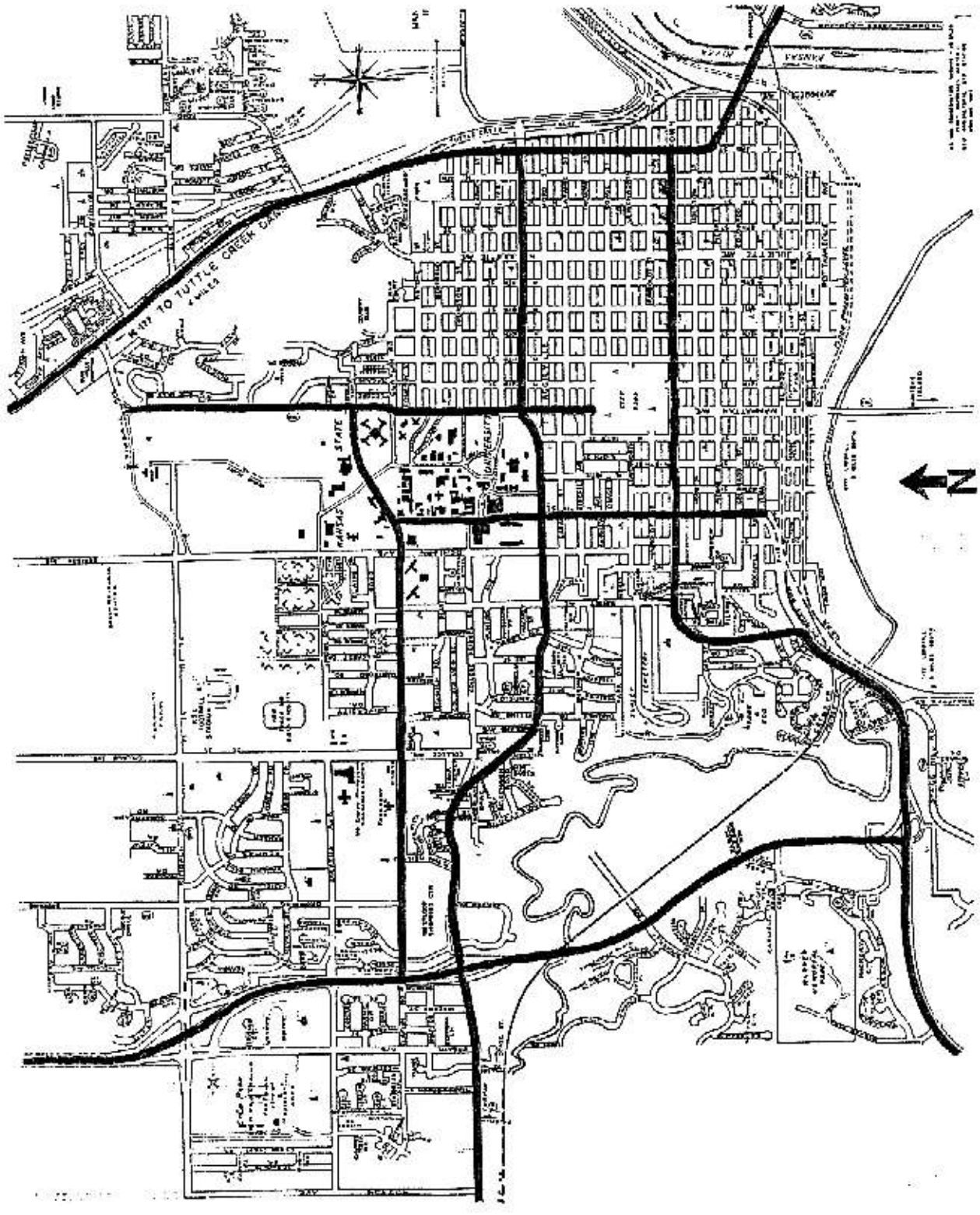

Figure 1

Basic Structure of Manhattan, Kansas

Figures 2 and 3 illustrate examples of level 2. Figure 2 is classified in level 2 because the parts are roughly related in terms of general direction and relative distance despite the absence of a single street. The map illustrated in Figure 3 is basically divided into two sections. Within each section, however, the parts are also roughly related in terms of distance and direction.

Maps representing structural quality level 3 are illustrated in Figures 4 and 5. Both maps display a basic understanding of the structure of the city while avoiding the complexity of bends and unparallel directions of streets.

An example of structural quality level 4 is illustrated in Figure 6. This map is structured by a road system that is similar to the actual structure of the city and the spatial distributions are relatively accurate as well. In short, this map displays an understanding of the complexities of the city structure.

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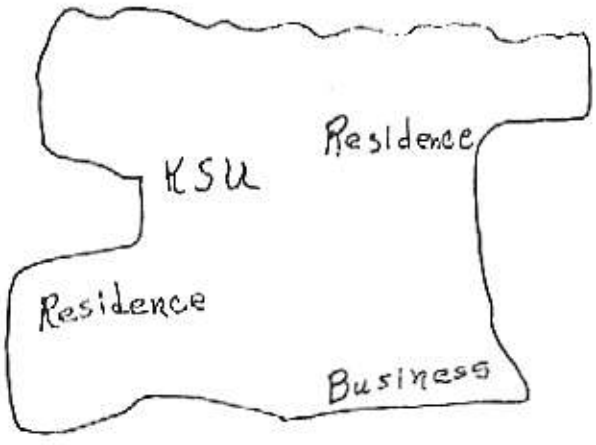

Figure 2

Structural Quality Level 2

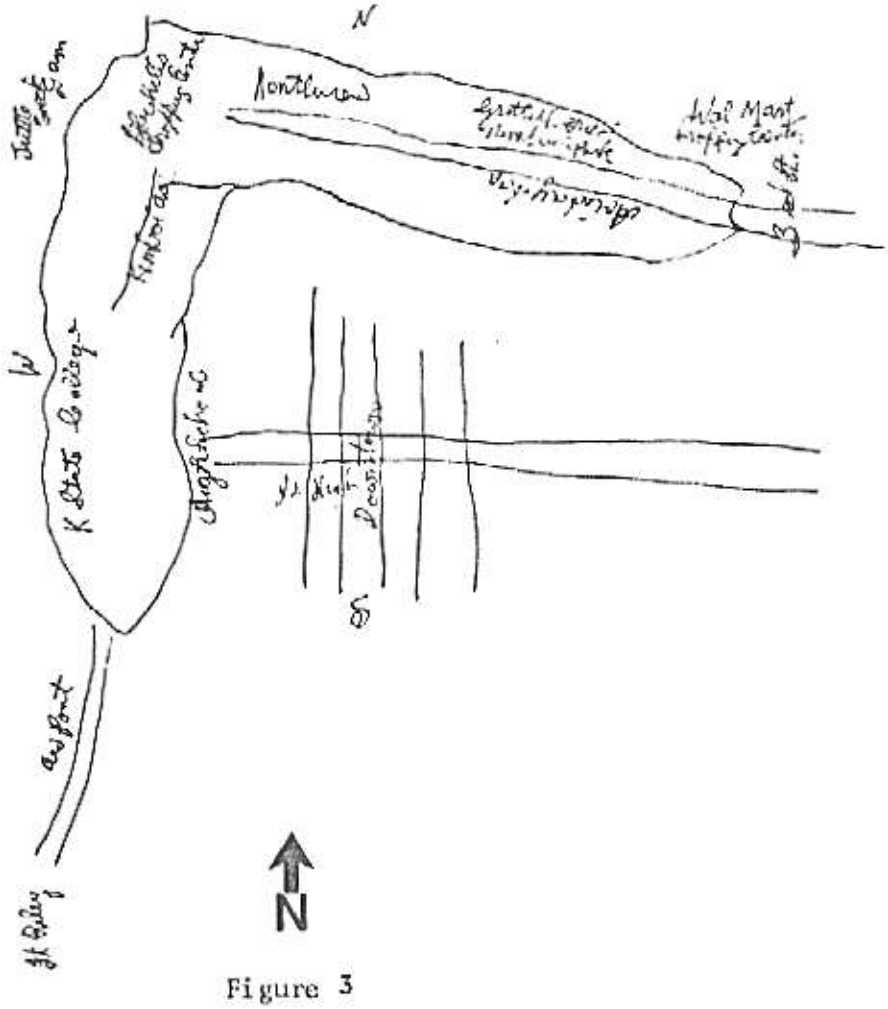

Figure 3

Structural Quality Level 2

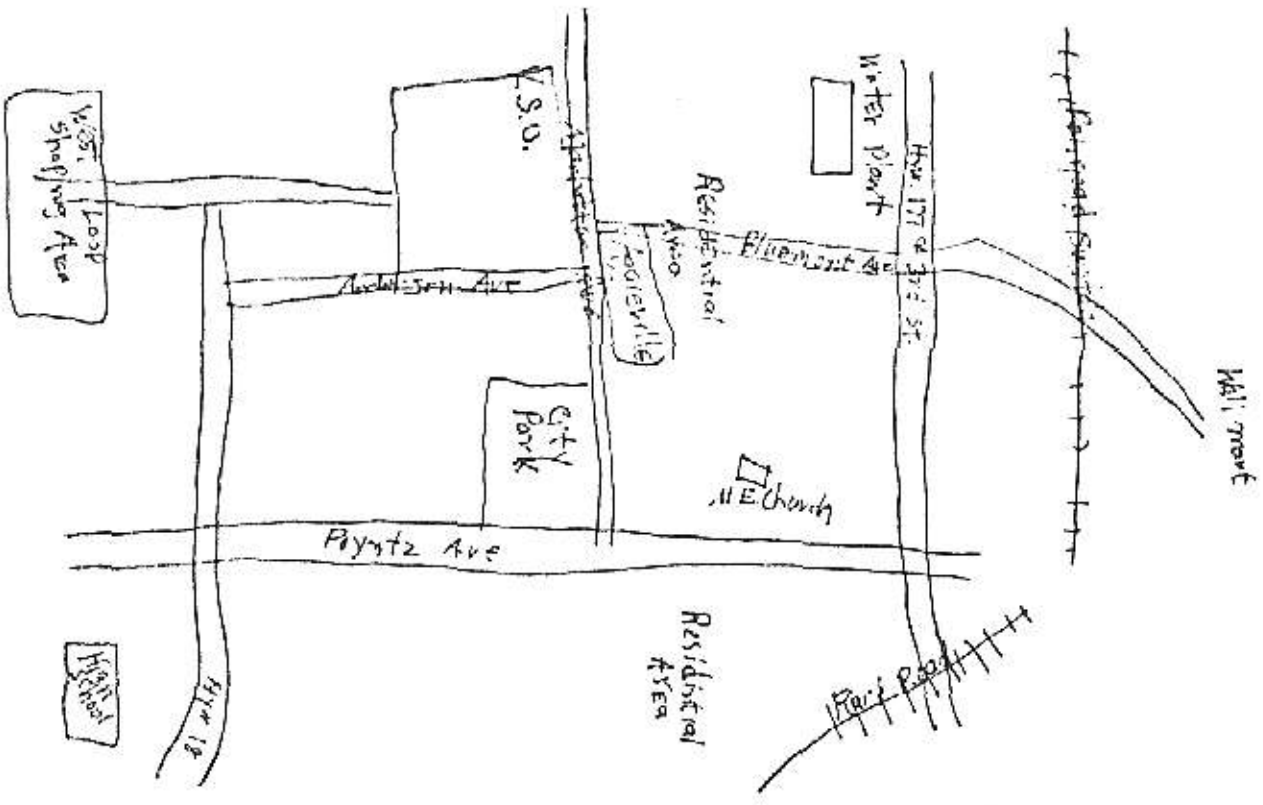

Figure 4

Structural Quality Level 3

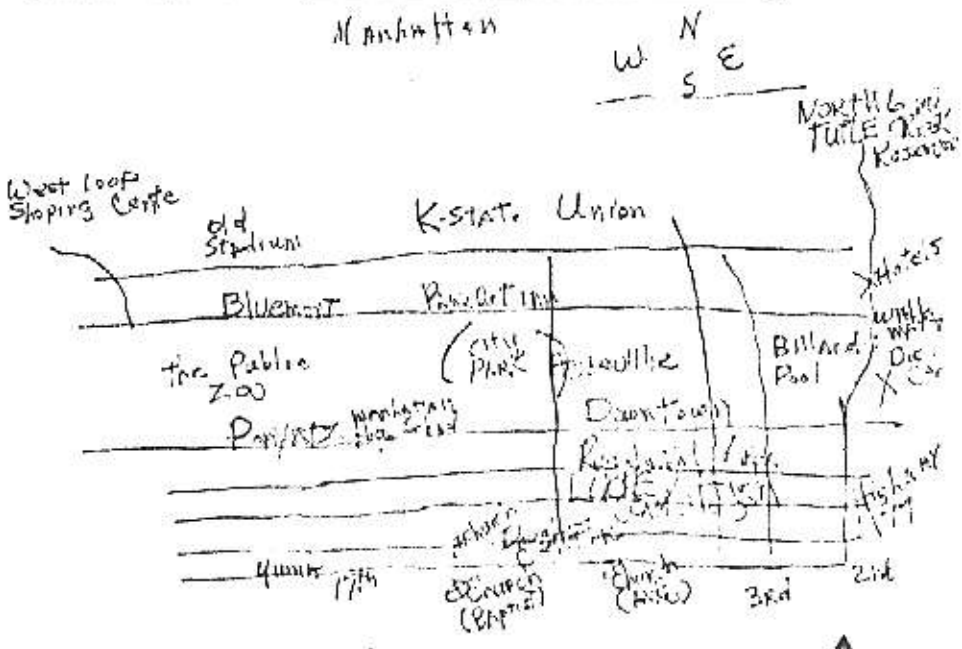

Figure 5

Structural Quality Level 3

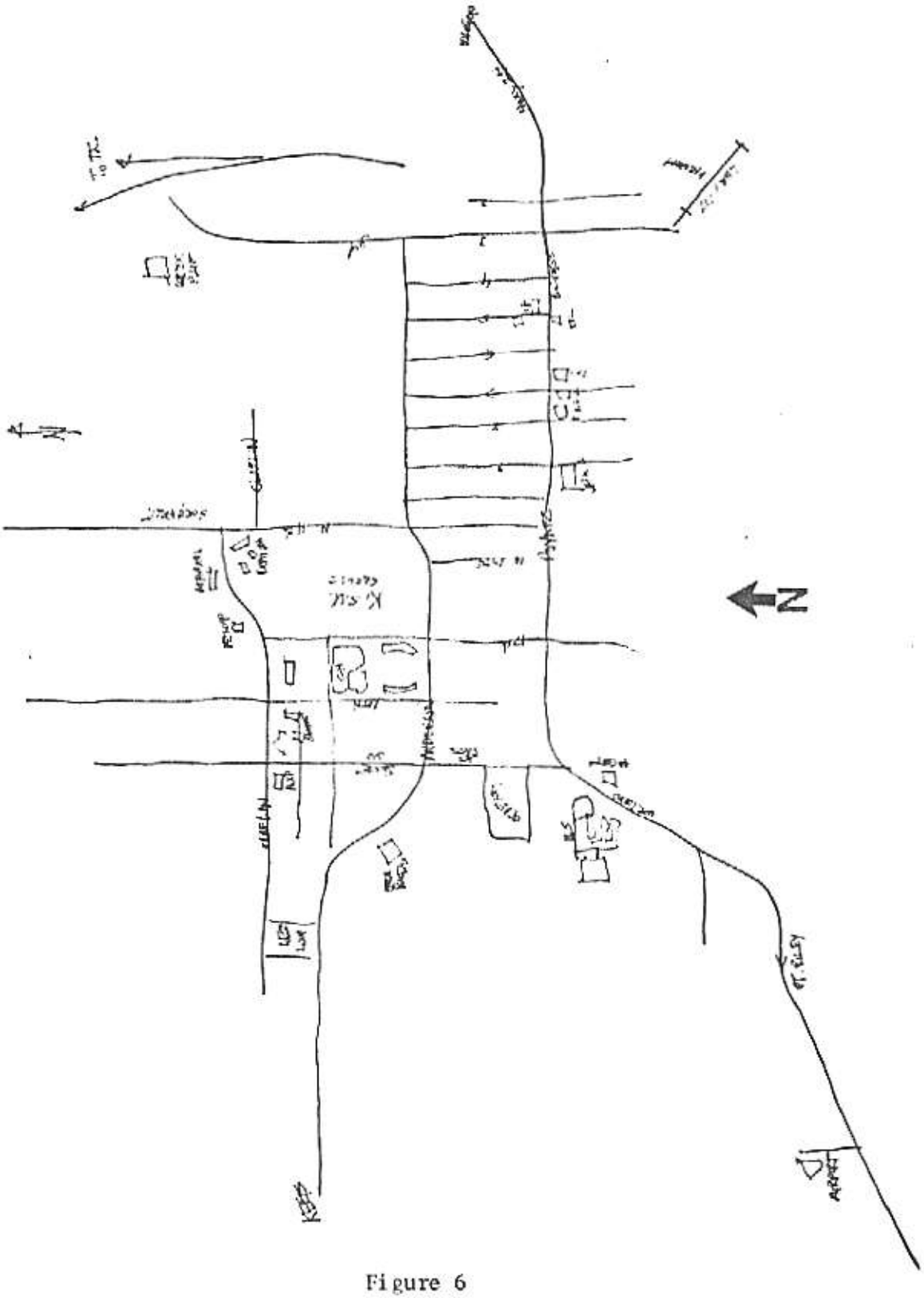

Figure 6

Structural Quality Level 4

Accuracy. Accuracy is operationally defined by determining the degree of correspondence between the pattern of sixteen specific locations on an objective map of the city and on the respondent's mental map. Waldo R. Tobler, who developed this technique, states the following: ". . . the technique allows computation of the amount of agreement between two dot distributions."[9] In this study, the degree of correspondence is termed the "per cent fit" and is written in the form of a percent. The sixteen accuracy locations are placed on the mental map by the respondent after he or she has initially completed sketching the map. The respondents are not shown the list of these locations until after they have completed their mental map so that these accuracy locations will not affect the density measure previously discussed. Colored pencils are furnished so as to distinguish between the initial mental map and the accuracy locations.

Tobler's explanation of the theory behind the degree of correspondence follows.

> The method is comparable to the ordinary product moment (Pearsonian) correlation and least squares regression procedures, extended for comparisons of two-dimensional distributions. The difference is that instead of pairing one-dimensional observations (of the form x;y) one has paired locations (of the form x,y; u,v). From these paired couples one can compute a spatial correlation.[10]

A computer program also developed by Tobler was used to calculate the per cent fit of the mental maps. This program requires the precise position of each location included in the pattern of points from a mental map and also from an objective map. It should be remembered, however, that the

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[9]Waldo R. Tobler, "Computation of the Correspondence of Geographical Patterns," Papers of the Regional Science Association, 1965, p. 131.

[10]Ibid.

patterns of points are being compared and not the respective points themselves. The relative positions of these accuracy locations is found by superimposing a sheet of graph paper over a map and noting the x,y coordinates of each point. The x and y axes are always placed on the extreme south and west sides of the map respectively. This process is carried out for each mental map and an objective map of Manhattan. In order to clarify this process which is difficult to verbalize, an example will follow that illustrates the entire process.

Figure 7 illustrates an objective map of Manhattan with a superimposed grid. The sixteen accuracy locations are also marked on this map by number. Table 1 lists these locations with their respective code numbers that appear on the map.

Table 1

Accuracy Locations

1 Westloop Shopping Center
2 Corner of Manhattan Ave. and Anderson Ave.
3 Corner of 3rd St. and Poyntz Ave.
4 Alco Department Store
5 Walmart
6 Manhattan Area Vocational Technical School
7 Sunset zoo
8 New K.S.U. football field
9 Northview Park
10 Sky-Vue Drive-In Theater
11 K.S.U. Student Union
12 Marlatt School
13 Hi-rise for the elderly
14 Douglass Center
15 Post Office
16 Johnny Kaw statue

Figure 8 illustrates a mental map with the same grid and accuracy locations as included on the objective map of Figure 7. In order to determine the precise position of each location, the x,y coordinates are noted. Table 2 shows this position data and the resultant per cent fit.

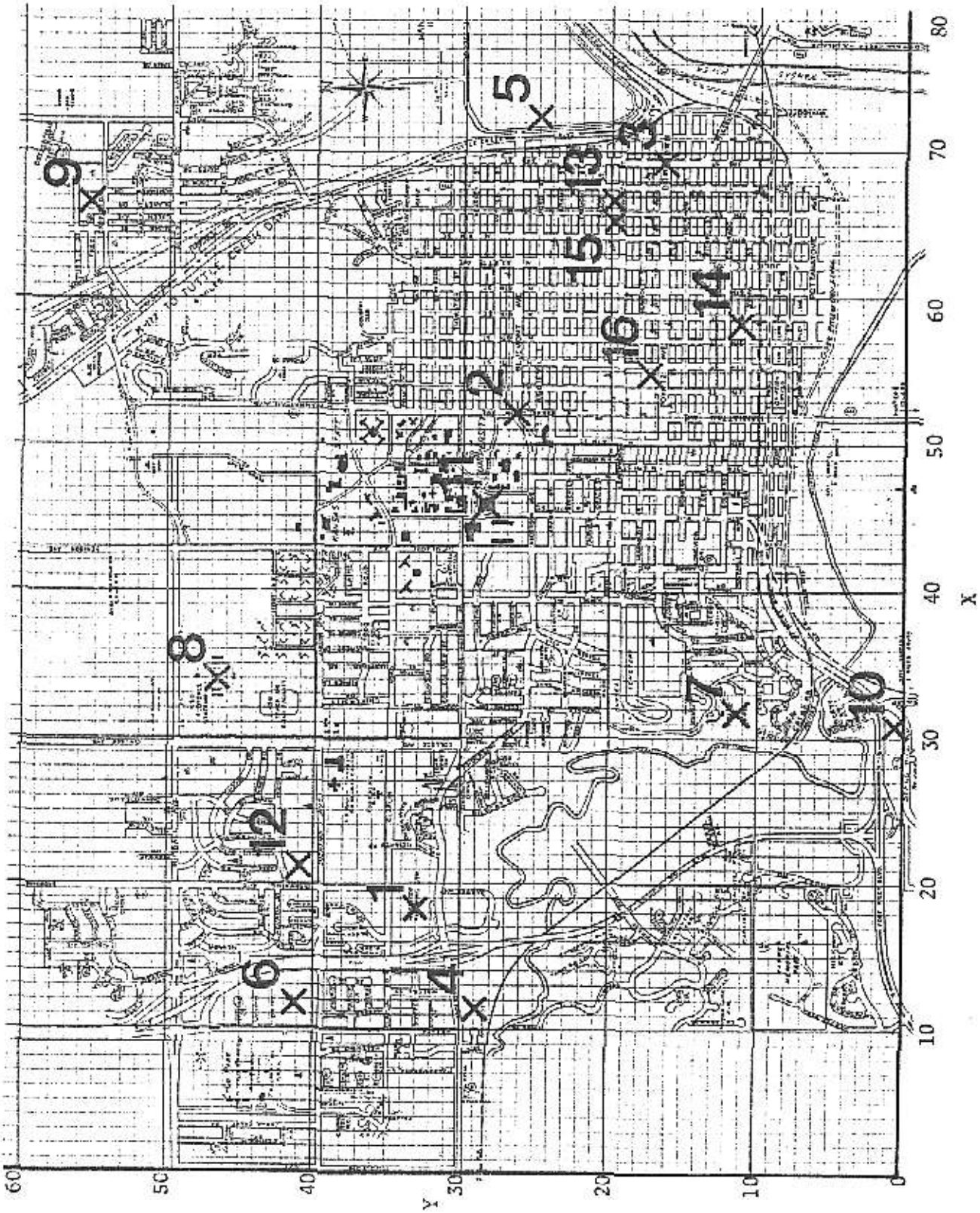
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Figure 7

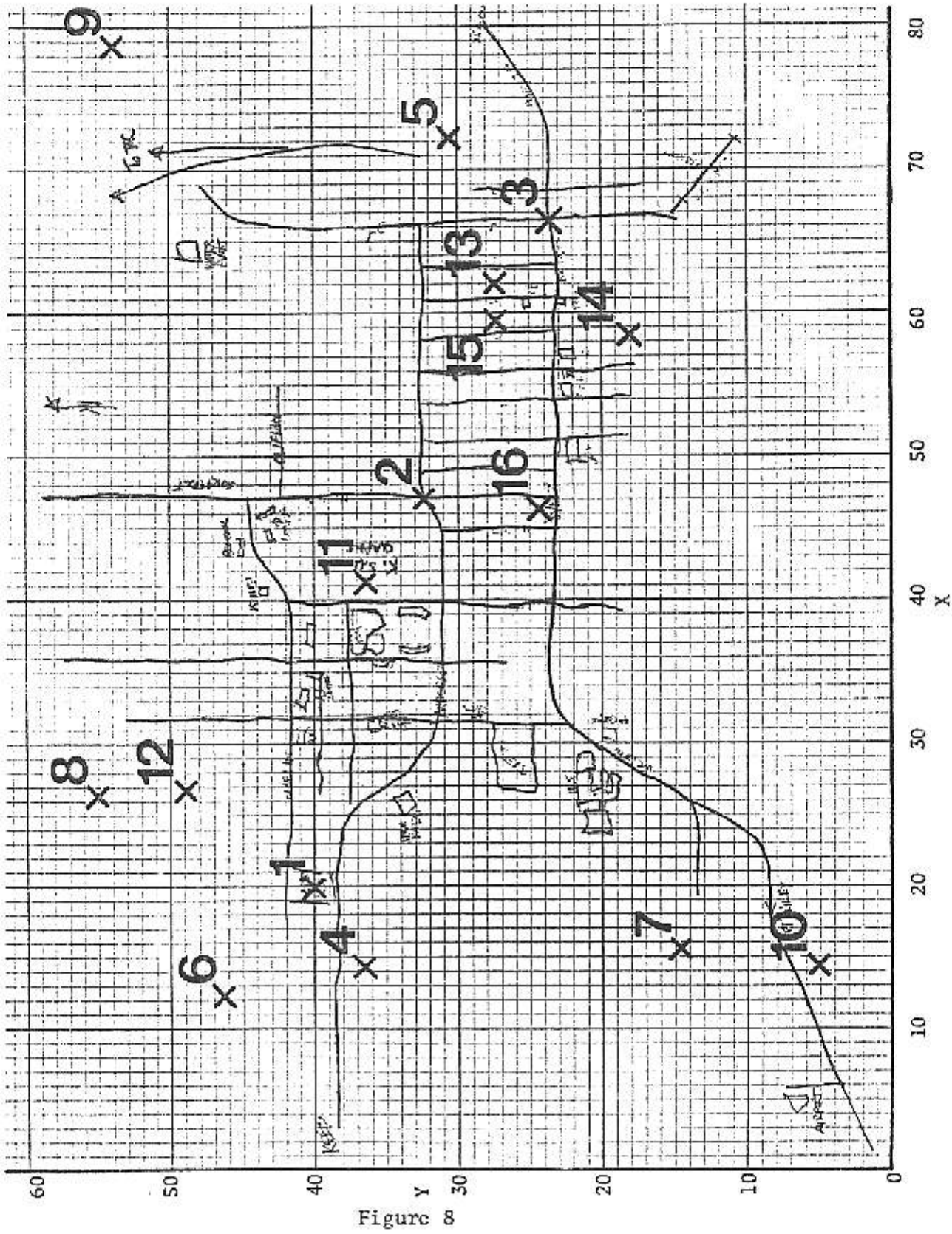

Figure 8

Mental Map with Grid Overlay and Accuracy Locations

Table 2

Per Cent Fit Data of Sample

Location	Objective Map X	Objective Map Y	Sketch Map X	Sketch Map Y
1	19	33	20	40
2	52	26	47	32
3	69	16	66	24
4	11	29	14	37
5	72	25	72	31
6	12	41	12	46
7	32	11	16	15
8	34	47	26	55
9	67	56	79	54
10	31	1	15	5
11	46	29	41	36
12	21	41	27	49
13	66	20	62	27
14	58	11	59	18
15	65	20	60	27
16	55	17	46	24

R = .9316 Per Cent Fit = 86.79

In order to determine the position of each location as precisely as possible, the scale of the maps should be larger and/or the grid size smaller. The combination used in this example was chosen for clarity of graphics.

Edge Problem. When using mental maps as a measuring device, the edge of the paper on which the map is to be drawn becomes a crucial issue. Problems caused by the edge of the paper arise when a respondent misjudges the scale of his or her map and finds that there is not enough room on the paper to fit all that was intended. This situation usually has the result of the respondent crowding elements of the city closer together as he or she draws closer to the edge of the paper. More technically, the scale of the mental map becomes a function of distance from the edge of the paper rather than remaining relatively constant. Obviously, accuracy that is lost due to the edge problem is due to the lack of the technical ability to draw and scale a map, and not necessarily to the inaccuracy of one's mental map. This problem is crucial in this study because accuracy is one of the dimensions being measured in order to arrive at a measure of knowledge of the physical environment.

Donald Appleyard discusses a method used that seems to be an attempt to deal with the edge problem in the article, "Styles and Methods of Structuring a City." In Appleyard's study, the respondents were asked to draw a map of the whole city between two locations which are on opposite sides of the city. This method seems to have some drawbacks, however. By stipulating two extreme locations, the linearity of the city is emphasized which in turn biases any attempt to objectively measure the structure of the mental map. Furthermore, respondents may experience the same crowding problems when trying to fit a whole city between two extreme locations as is experienced when attempting to fit the whole city on a sheet of paper. Thus, this method does not seem to solve the edge problem.

In this study, the paper on which the respondent is to draw the mental

map is folded in order to give the impression that the paper is smaller than it actually is. Each respondent is asked to try to fit their sketch map of the entire city of Manhattan, Kansas on the paper in its folded condition, which measures 11 inches by 8.5 inches. They were also told, however, that if they could not fit as much of the city on the paper as they desired, it was possible to unfold the paper in order to have an extra 3.5 inches on all sides. The unfolded dimensions of the paper are 18 inches by 15.5 inches. The extra 3.5 inches on all sides gave the respondents room to allow for possible misjudgments in scale.

Operational Definition of Satisfaction with the Environment

Satisfaction with one's environment is operationally defined by a series of questions whose coded values are summed in order to arrive at a measure along a continuum of increasing satisfaction. The questions used in this measure are derived from nine specific dimensions of satisfaction with the city in which one lives: (1) physical appearance, (2) friendliness of people, (3) size of city, (4) noise level, (5) safety, (6) recreation, (7) activity, (8) mobility in city, and (9) entertainment.

The nine dimensions of satisfaction are measured with a questionnaire in which statements are made concerning the respondent's satisfaction or dissatisfaction with each dimension. Respondents are asked to reply to each of these statements by selecting the intensity response that best fits his or her reaction. The choices are as follows.

agree strongly	agree	neutral	disagree	disagree strongly

A copy of the questionnaire is in Appendix A (page 48). An answer that represents the highest level of satisfaction is counted as 5 points. The

answers diminish in point value to the lowest level of satisfaction which is worth 1 point.

Other questions were asked that made it possible for the respondents to give their overall feelings and opinions of Manhattan. These questions also make it possible to check the reliability of the satisfaction measure. The first of these questions is number 10 in the questionnaire.

> If the opportunity presented itself, I would prefer living in another town.

agree strongly	agree	neutral	disagree	disagree strongly

In order to check reliability, the answer to this question can be compared to the mean of the answers to the nine dimension questions. If the nine dimensions are measuring the same thing as question 10, the two figures will be correlated.

Question 11 is used in much the same way as question 10. The answer can be checked for correlation with the total satisfaction level.

> Please rank the last 3 towns or rural areas in which you have lived in order of preference. Include Manhattan as one of these 3 areas. Number 1 should be the area you most prefer.
>
> (1)
> (2)
> (3)

If Manhattan is ranked as number 1, the question is given 5 points; if number 2, 3 points; if number 3, 1 point.

Question 12 is a structured open-ended question that allows the respondent to mention any reason he or she likes or dislikes Manhattan that was not covered in the questionnaire. Even if the advantage or disadvantage was mentioned in the questionnaire, the respondent is encouraged to list it again if

he or she feels that it is important. The question follows.

> List what you think the advantages and disadvantages are of living in Manhattan. Even if an advantage or disadvantage has been covered in a question already, feel free to mention it again.
>
> Advantages Disadvantages

Advantages are scored as 5 points each and disadvantages as -5 points each. By scoring in this manner, the person who does not feel like writing several items is not penalized when compared to the person who is enthusiastic in responding to the question. The score from this question is the sum of the total scores of advantages and disadvantages.

The level of satisfaction with the urban environment is obtained by summing the scores of the twelve questions just discussed.

CHAPTER 3

FINDINGS

Overview of Methodology

The first step in the methodology was to determine whether any of the control variables are causing variance in the knowledge dimensions or satisfaction scores. This was accomplished by calculating an analysis of variance of each of the knowledge dimensions and satisfaction with the control variables as the independent variables.

Step two determined whether satisfaction, density, per cent fit, and/or structure are correlated. The affects of any control variables found to cause variance in these measures were removed by computing pooled correlations corrected for those control variables.

Step three actually tested the hypothesized model. Multiple regression was computed to determine whether the three dimensions of the mental map predict satisfaction with the environment.

Analysis of Variance

Tables 3, 4, 5, and 6 illustrate the analysis of variance of satisfaction, structure, density, and per cent fit. The purpose of these calculations is to determine which, if any, of the control variables significantly cause any of the above measures to vary. It should be noted that the sample size for the analysis of variance calculations is N = 37. This is the result of the failure of six respondents to answer all demographic questions.

Table 3

Analysis of Variance for Satisfaction

Source of Variance	df	MS	F-ratio	Significance
Sex	1	232.8	3.0	.10
Age	3	99.7	1.3	.31
Race	1	68.4	0.9	.36
Education	4	53.5	0.7	.61
Length of Residence	1	178.3	2.3	.14
Marital Status	1	77.0	1.0	.33
Employment Status	2	167.2	2.1	.14
Income	1	71.7	0.9	.35

Note: N = 37 for each sample

Table 4

Analysis of Variance for Structure

Source of Variance	df	MS	F-ratio	Significance
Sex	1	0.71	2.0	.17
Age	3	0.63	1.8	.18
Race	1	0.60	1.7	.21
Education	4	0.11	0.3	.87
Length of Residence	1	0.23	0.6	.43
Marital Status	1	0.06	0.2	.67
Employment Status	2	0.47	1.3	.28
Income	1	1.97	5.6	.03*

Note: N = 37 for each sample

Table 5

Analysis of Variance for Density

Source of Variance	df	MS	F-ratio	Significance
Sex	1	14.0	0.09	.76
Age	3	124.1	0.83	.49
Race	1	44.3	2.10	.16
Education	4	129.2	0.30	.88
Length of Residence	1	5.5	0.87	.36
Marital Status	1	78.7	0.04	.85
Employment Status	2	170.9	0.53	.60
Income	1	148.7	1.15	.30

Note: N = 37 for each sample

Table 6

Analysis of Variance for Per Cent Fit

Source of Variance	df	MS	F-ratio	Significance
Sex	1	675.0	1.5	.24
Age	3	67.6	0.1	.93
Race	1	1052.0	2.3	.14
Education	4	366.7	0.8	.54
Length of Residence	1	2205.9	4.8	.04*
Marital Status	1	169.9	0.4	.55
Employment Status	2	77.9	0.2	.84
Income	1	96.4	0.2	.65

Note: N = 37 for each sample

The above analysis of variance calculations show that the only control variables causing variance in any of the four measures are length of residence and income which affect the per cent fit and structure of the mental map, respectively. Length of residence will be discussed first.

To interpret the finding that length of residence causes the per cent fit of the map to vary, it is necessary to determine the direction of the relationship. Table 7 illustrates the mean score of per cent fit for each category of length of residence. The categories of length of residence have been collapsed to only two categories. This was necessary because the number of respondents in the un-collapsed categories was so small as to invalidate any findings.

Table 7

Direction of Length of Residence and Per Cent Fit Relationship (N = 37)

Length of Residence	N	Mean Score of % Fit
Less than 10 years	16	43.9
10 years or more	21	70.0

Table 7 shows that the longer a person has lived in Manhattan, the more accurate his or her mental map becomes. This finding seems quite significant despite the collapsed categories because the difference in the mean score of per cent fit between the two length of residence categories is so drastic.

The analysis of variance also showed that income causes the structure scores to vary. This finding is not deemed to be as important as the length of residence finding because the relationship may be the result of faulty wording in the income level question of the questionnaire. It was noticed that housewives tended to claim an income in the lowest category because they,

personally, had no income. In future research, this question should be worded to include the income of both the husband and wife. Therefore, this relationship is not to be seriously considered in this study.

Correlations of Variables

As a result of the analysis of variance calculations, length of residence was found to be the only control variable to significantly cause any of the measures of knowledge and satisfaction to vary. (Income is omitted as discussed previously.) Therefore, in order to determine the correlations between the per cent fit, density, structure, and satisfaction, the influence of length of residence will be controlled by using pooled correlations. Table 8 illustrates these pooled correlations.

Table 8

Pooled Correlation Corrected for Length of Residence

	Satisfaction	Structure	Density	Per Cent Fit
Satisfaction	1.00			
Structure	-0.24	1.00		
Density	0.04	0.72*	1.00	
Per Cent Fit	0.08	0.33*	0.16	1.00

N = 37
* if $r \geq .33$ then $p. < .05$

The pooled correlations show that structure is significantly correlated with density and per cent fit. No other correlation is significant. Table 8 shows the three dimensions of mental maps to be more correlated with each other than they are with satisfaction. These correlations imply that maps which possess high levels of structural quality also tend to possess higher

levels of density and accuracy.

The fact that structure is ordinal data and per cent fit, density, and satisfaction are interval data may cause concern as to the validity of the correlations found in Table 8. Therefore, the above interval data were transformed into ordinal data by simply dividing each interval measure into thirds: high, medium, and low. Table 9 illustrates the pooled correlation of the measures in their ordinal form.

Table 9

Pooled Correlation (Data in Ordinal Form)
Corrected for Length of Residence

	Satisfaction	Structure	Density	Per Cent Fit
Satisfaction	1.00			
Structure	-0.20	1.00		
Density	-0.07	0.71*	1.00	
Per Cent Fit	-0.11	0.43*	0.25	1.00

N = 37
*if $r \geq .33$ then $p. < .05$

Table 9 shows that the ordinal data yields the same significant correlations as did the interval data and the correlations not significant varied very little. Therefore, it is felt that results from the interval data are sufficiently similar to the ordinal data results to validate the results obtained from the data in interval form.

Testing the Hypothesized Model

It was hypothesized that knowledge of the urban physical environment is a partial predictor of satisfaction with the urban environment. Knowledge is operationally defined by measuring the three dimensions of the mental map:

structure, per cent fit, and density. Therefore, multiple regression was calculated to determine if these three measures of the mental map predict satisfaction.

In order to determine the best model possible in this study to predict satisfaction, multiple regression was calculated in three steps. The first step included one independent variable and then one was added in each successive step until the entire model was included. Structure was the first independent variable to be included in the computation because it had the highest correlation of the three dimensions with satisfaction (Table 8). Per cent fit and density were added in the second and third steps respectively because their correlations with satisfaction became progressively lower. Table 10 illustrates these steps and the results.

Table 10 shows the best model of the three to be step 3. This conclusion is based on the finding that R square, which is the coefficient of determination, is highest in step 3. Therefore, structure, per cent fit, and density combined, predict twenty-four per cent of the variance of satisfaction. Although the three dimensions of mental maps, as operationally defined in this study, predict only a small part of the variance of satisfaction, it has been shown that knowledge of the urban physical environment is a partial predictor of satisfaction with the urban environment.

Satisfaction Reliability Analysis

Reliability is of great concern in this study due to the questionable methodology employed in deriving the dimensions of satisfaction with the environment. In order to determine the reliability of the data, the internal consistency of the satisfaction questionnaire was determined and the reliability coefficient (Alpha) was calculated as well. *Internal consistency will be*

Table 10

Multiple Regression of Model

Independent Variables Added in Steps
N = 43
Dependent Variable - Satisfaction

Step 1	Independent Variable	Structure
multiple R = 0.27	df = 1	
R square = 0.07	MS = 379.9	
	F = 3.11*	

*if $F \geq 4.08$, then $p. < .05$

Step 2	Independent Variables	Structure Per Cent Fit
multiple R = 0.44	df = 2	
R square = 0.19	MS = 524.75	
	F = 4.84*	

*$p. < .05$

Step 3	Independent Variables	Structure Per Cent Fit Density
multiple R = 0.49	df = 3	
R square = 0.24	MS = 438.2	
	F = 4.2*	

*$p. < .05$

discussed first.

Table 11 illustrates the correlations between the means of each of the twelve questions measuring satisfaction and the mean of the total satisfaction scores. As the table illustrates, only two of the twelve questions are not significant at the .05 level: questions 5 and 8. Question 5 is concerned with a feeling of safety. It is possible that safety is not correlated with

satisfaction because it is more closely related to other variables not considered in this study. Area of town where one resides is an example of

Table 11

Satisfaction Reliability Analysis N = 43

Question	Correlation with total (r)
*1	.3819
*2	.5269
*3	.5590
*4	.3595
5	.0278
*6	.7868
*7	.6163
8	-.0164
*9	.5542
*10	.8301
*11	.7807
*12	.6432

*$p < .05$

such a variable. Question 8 is concerned with ease of travel in Manhattan. The same basic reasoning may be applied to this non-correlation as was to question 5. An example of a variable that may more closely correspond with the satisfaction with one's mobility is ownership of a car. Answers to question 8 may be in response to the public transportation offered in Manhattan. Residents who own cars may not be aware of a transit problem if one indeed exists.

In order to further test the internal consistency of the satisfaction questionnaire, the odd numbered questions were correlated with the even numbered questions. The finding that r = .78, which is significant at the .05 level, confirms the results of the individual question correlations.

One final check of internal consistency was made to determine if the mean of the scores of questions 1 through 9 correlates with question 10. It should be remembered that questions 1 through 9 measure the nine dimensions of satisfaction. Question 10 follows.

> If the opportunity presented itself, I would prefer living in another town.

With the sample size of N = 43, the correlation was found to be r = .51, which is significant at the .001 level. This finding further substantiated the claim of internal consistency.

The reliability coefficient (Alpha) was also calculated for the twelve satisfaction questions. The formula for calculating Alpha follows.

$$\text{Alpha} = \frac{n}{n - 1}\left(1 - \frac{V_i}{V_t}\right)$$

n = number of questions in questionnaire

V_i = summation of variance of each question

V_t = variance of total score

Alpha was found to be Alpha = .76. This level of reliability is high enough to invoke confidence in the potential validity of the satisfaction measure.

Satisfaction Validity Analysis

In the book, Foundations of Behavioral Research, Fred N. Kerlinger states that there are three types of validity: content, criterion-related, and construct. Content and construct validity are of particular interest

in this study.

For a measuring instrument to have content validity, its content must be representative of a universe of content of the property being measured. Since it is not possible to select random samples of items from a universe of the content of satisfaction with the environment, the content validation of the instrument was essentially judgmental in nature. This is to say that *each of the nine dimensions* was judged for its presumed relevance to satisfaction with the environment. Since it is not uncommon to ask others to examine an instrument for its content, two professors were asked to do so and found it to be basically sound. Therefore, the claim of content validity of the satisfaction measure is necessarily based on intuition.

To determine construct validity, it is necessary to determine what property or properties "explain" the variance of the test. In this study, it has been shown that the three dimensions of knowledge of the urban environment explain twenty-four per cent of the variance of satisfaction with the urban environment. Although the amount of explained variance is small, a trend is shown which, in turn, demonstrates a degree of construct validity.

In conclusion, the satisfaction measure has been shown to be valid in terms of content validity and construct validity. This finding, coupled with the reliability of the measure, makes it possible to claim that satisfaction with the urban environment was indeed measured by the instrument used in this study and that the measure was consistent, stable, and accurate.

Knowledge Reliability Analysis

The reliability of knowledge of the physical environment is difficult to determine since none of the techniques used to measure *the three dimensions* of knowledge lend themselves to internal consistency tests or the Alpha test.

It is not possible to use either of these reliability tests because none of the three dimensions are composed of several items that may be compared to the total score of the particular dimension. For this reason, the stability and accuracy of the measure will be discussed.

Whenever dealing with subjective responses, one is faced with the problem of stability. Stability may be defined as the acquisition of the same or similar results if the same object is measured again and again.[11] Kerlinger[12] argues that reliability and accuracy may be achieved by obtaining the same rank-order of results if the test is given several times to the same respondents. It seems highly unlikely that this criteria would be met by the accuracy and density measures of this study when left in their interval form. Since these interval data were transformed into ordinal data, however, the possibilities of the same rank-order of results seems much greater. Therefore, the measures of knowledge are as reliable as the technique will allow, but it seems obvious that research is needed to develop more reliable techniques.

Knowledge Validity Analysis

The validity of the knowledge measure is supported by the research of Kevin Lynch and Donald Appleyard. Their research has produced the three dimensions or constructs of the mental map used in this study. It should be remembered that knowledge of the physical environment is defined as the knowledge that permits purposeful mobility within the city. It is important also to remember that the mental map is made up of knowledge and, in fact,

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[11] Ibid., p. 443.

[12] Ibid., p. 444.

structures it. Therefore, the knowledge measure seems to have content validity.

Although the validity of dividing knowledge into the three dimensions of mental maps seems to be rather well established, the validity of the individual dimension measures may be lacking. In order to claim validity of a measure, one must be certain that the property in question is indeed being measured by the employed technique. All three of the dimensions of knowledge, as operationally defined in this study, may fall short of meeting this criteria because of the subjective nature of the mental map.

The technique for measuring density is not as valid as it should be *because influences other than* the density of elements in a person's mental map cause variation in the density of his or her sketch map. One such influence is the respondent's willingness to fill out the questionnaire. Techniques need to be developed that are not influenced by this phenomenon of subjective responses.

Structural quality intuitively seems to be the most valid and reliable of the three dimension measures. The validity of this measure is not as certain as is desired, however, because the drawing ability of the respondent may cause some unwanted variance of the score. A lack of drawing ability may cause some respondents to draw as simple a map as is possible in an effort to avoid any confusion or error in the sketch. This process may result in a low structural quality score which would reflect the respondent's drawing ability rather than the structural quality of his or her mental map. Error in measurement obviously needs to be remedied if a more valid measure is to be obtained. Since the accuracy locations are placed on the map after the structure is drawn, the accuracy measure is affected by drawing ability also.

In conclusion, despite efforts to measure the three dimensions of knowledge as objectively as possible, the validity of these measures is threatened by the subjective nature of the mental map itself. This is not meant to imply that the knowledge measure is invalid, however. The finding that the three measures of knowledge seem to correlate with each other rather well (Tables 8 and 9) implies validity. Therefore, the validity of the dimensions seems strong enough to encourage more research in the area with more reliable and valid measurement techniques.

CHAPTER 4

CONCLUSION

Problem of Interpretation

The finding that knowledge of the physical environment predicts twenty-four per cent of the variance of satisfaction with the urban environment is difficult to interpret. It was hypothesized that knowledge is only one of the predictors of satisfaction. Therefore, the hypothesis is supported as the said relationship was shown to be significant at the .05 level. A problem of interpretation arises because the amount of variance in satisfaction found to be predicted by knowledge is less than had been expected. Attention now needs to be focused on the remaining seventy-six per cent of the variance of satisfaction. The discussion of this unexplained variance needs to be prefaced by a brief discussion of variance itself.

Variance may be classified into two types: systematic and error. "Systematic variance is the variation in measures due to some known or unknown influences that 'cause' the scores to lean in one direction more than another."[13] "Error variance is the fluctuation or varying of measures due to chance."[14] Error variance can also be defined in terms of reliability since reliability is the stability and accuracy of an instrument. Therefore, the greater the reliability of an instrument, the smaller the error variance.

The above definitions of systematic and error variance have important

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[13] Ibid., p. 74.

[14] Ibid., p. 77.

implications in this study. One such implication stems from the fact that systematic variance is caused by known or unknown influences. The unknown influences are of interest in this study since only a small portion of the variance of satisfaction was shown to be explained by knowledge. Another implication arises from the relationship between error variance and reliability. Reliability of the instrument used to measure knowledge is a crucial issue in this study. The unknown influences causing variance in the dependent variable will be discussed first.

Unknown Influences

One of the assumptions made in this study is that the measurement of an individual's mental map of the entire city is a valid measure of the individual's knowledge of the physical environment. It should be remembered that knowledge of the physical environment is defined as that knowledge which permits purposeful mobility. The possible weak point of this assumption is that a mental map of the entire city was used to measure knowledge. D. C. D. Pocock says the following about the extent of a mental map.

> The mental map portrays only a portion of the real world, since it is impossible for man to have first-hand experience or even second-hand knowledge of all parts. Only the planner normally adopts a comprehensive view.[15]

J. Sonnenfeld has divided the total environment into four levels of behavioral environments that he terms a nested set of environments. His definitions of the four levels follow.

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[15]D. C. D. Pocock, "City of the Mind," Scottish Geographical Magazine, Vol. 88, No. 2, Sept., 1972, p. 116.

> The whole environment that is external to man, the entire world, is the objective geographical environment. Within this larger sphere is included the operational environment or the environment in which man operates. It consists of the portions of the world which impinge on *man, influencing his* behavior in some way or another whether or not he is aware of it. The portion of the operational environment of which man is aware is the perceptual environment. The awareness may be derived either from learning and experience or from physical sensitivity to environmental stimuli. Thus, at this level a portion of the environment is symbolic rather than objectively measurable. The least-inclusive level is the behavioral environment, the portion of which elicits a behavioral response or toward which behavior is directed.[16]

The above *definitions have vast implications for* studies such as this. Geographical environments may be considered as the city rather than the world when dealing with the city scale. The operational environment then becomes the portion of the city in which man operates. Sonnenfeld argues that it is useful to focus on the functional environment when studying man's perception of the environment.

If Sonnenfeld's nested set of environments and Pocock's argument that the mental map portrays only a portion of the real world are combined, it becomes apparent that the mental map portrays one's operational environment. Pocock verifies this assumption by arguing the following.

> The basic nodes around which the action space (operational environment) revolves, and the mental map is built up, are the home, place of work and perhaps, city centre. Further nodes are added with the increasing in number and

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[16]Thomas F. Saarinen, Perception of Environment, Resource Paper No. 5 (Association of American Geographers, 1969), p. 5.

variety of roles a person plays.[17]

Pocock's statement above also implies that mobile individuals have more comprehensive mental maps than those who are not so mobile. Therefore, by forcing respondents to sketch their geographic environment, this study may have measured not only knowledge, but mobility as well.

By focusing on one's operational environment rather than the geographical environment, the problem caused by the size of the city might be resolved also. The size problem stems from the need to develop a method to compare knowledge residents have of their respective cities in an objective manner. If a resident were asked to draw a mental map of Manhattan, New York, and the map were measured in the same manner as those of this study, the accuracy and structural precision scores would probably be lower than those of this study. This could be explained by a ratio between the size of the operational and geographical environments of a resident of Manhattan, New York and the same ratio for a resident of Manhattan, Kansas. The Kansas ratio would probably show a much closer relationship than that of New York. Therefore, the resident of a small city will probably be able to locate elements throughout the city more accurately than a resident of a large city and the same results might occur when considering structural precision. Density might show an opposite trend since a resident of a large city merely has more elements at his or her disposal to place on the mental map than does a resident of a small city.

The measurement of the three dimensions of the mental map--density, structure, and accuracy--need to be refined if only the operational environment

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[17] D. C. D. Pocock, "City of the Mind," Scottish Geographical Magazine, Vol. 88, No. 2, Sept., 1972, p. 116.

is to be considered. Density might somehow become a function of the percentage of the total city included in the mental map. Accuracy would probably be measured by determining the per cent fit of the set of points the respondent initially places on his or her map. By measuring the points initially placed on the map, each map will have different accuracy locations, but the respondent will not have been forced to locate items outside his or her operational environment. The structural precision measure would have to consider only the portion of the city illustrated on the mental map. In this study, the maps were evaluated as to how well they illustrated an understanding of the structure of the entire city.

In conclusion, a possible unknown influence on satisfaction that is directly related to this study might be knowledge of the operational environment. Perhaps knowledge of the operational environment is a better predictor of satisfaction with the urban environment than is knowledge of the geographical environment.

Reliability Problem

The technique used in this study to measure the mental maps does not lend itself to a reliability check. It is difficult, therefore, to speculate as to the reason for the low correlation between the mental map measures and the satisfaction measure. Low correlations are generally due to either a lack of a relationship or low reliability of the instrument. Without a reliability measure, one cannot speculate as to which of the two is the cause for low correlations. It is obvious that techniques need to be developed that may be subjected to some sort of reliability check.

In this study, intuitive reliability of accuracy and density was increased by categorizing both measures. It seems probable that a person will

be able to consistently score in one of the categories of high, medium, or low accuracy or density.

The categorization of density and accuracy should not be considered a solution to the reliability problem. The fact still remains that it is impossible to compute a reliability coefficient of the measures of knowledge even after categorization. Therefore, it is possible that another influence affecting the variance of knowledge is error variance. Since it is a statistical goal to minimize error variance, efforts are needed to develop a reliable measurement technique of knowledge of the environment.

Concluding Remarks

Emerging from behavioral research is a new predictive theory of satisfaction with the urban environment. This theory will have an enormous impact on the city planning and urban design profession. With this new theory, it will be possible to base urban design on the effects that physical form has on human behavior. This emphasis on behavior will be a long needed switch from the past emphasis on urban esthetics, which seemed to be based on the theory that a beautiful city is a happy city. It will hopefully be possible to refine a behavioral theory in order to produce design solutions that are compatible with different social and/or ethnic groups in the city rather than designing everyone's environment to fit the white middle-class standards and norms.

It seems to this author that it is a necessity for the city planning profession to strive toward a behavioral theory. The need of such a theory is demonstrated by the notorious housing projects and urban renewal projects that have failed and were doomed to failure from the beginning simply because

the planning and designing was based on esthetics and the intuition of a predominantly white middle-class profession. It is no wonder that many city inhabitants have little faith in city planners and designers when one realizes that this lack of faith stems from the belief that these planners actually do not know how to design environments suitable to the life styles of the potential inhabitants. The disturbing point of this criticism is that it is more true than most planners would like to admit. It seems as though the only course of action open to those planners who feel trapped by the paradox of planning and designing without understanding the ramifications of their designs is behavioral research.

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APPENDIXES

APPENDIX A

QUESTIONNAIRE

Please fill out the following questions. There are no right or wrong answers to these questions, so please do not worry about making a response that might seem wrong or foolish.

Circle the appropriate answer.

(1) My sex is: male female

(2) My age is:

6-14	30-34	50-54	70-74
15-19	35-39	55-59	70-over
20-24	40-44	60-64	
25-29	45-49	65-69	

(3) I am a:

Caucasian

Black

Oriental

Mexican-American

Indian

other

(4) I have the following education:

completed 8th grade

completed high school

completed 2 years of college

college graduate

post graduate work

(5) I have lived in Manhattan for:

less than 1 year	6-8 years
1-2 years	8-10 years
2-4 years	10-over
4-6 years	

(6) I am: married single widowed

(7) Will you please draw a map of the entire city of Manhattan, Kansas. Draw it as if you were describing the city to a stranger, covering what you consider to be the main features. A rough sketch is all that is expected, but try to draw it as accurately as possible. Please remember to label items as you put them on your map.

(8) Please locate the following on your sketch map if you have omitted them.

Westloop Shopping Center
Corner of Manhattan Ave. and Anderson Ave.
Corner of 3rd St. and Poyntz Ave.
Alco department store
Walmart
Manhattan Area Vocational Technical School
Sunset Zoo
New K.S.U. football field
Northview Park
Sky-Vue Drive-in Theater
K.S.U. Student Union
Marlatt School
Hi-rise for the elderly
Douglass Center
Post Office
Johnny Kaw statue

(9) Place an arrow in the direction of north on your sketch map.

Please circle the appropriate response.

(1) I am satisfied with Manhattan's physical appearance.

agree strongly	agree	neutral	disagree	disagree strongly

(2) Some would like to live in a town where the people are very friendly and others would just as soon be left alone. I am satisfied with the friendliness of the people in Manhattan.

agree strongly	agree	neutral	disagree	disagree strongly

(3) The size of Manhattan just suits me.

agree strongly	agree	neutral	disagree	disagree strongly

(4) Manhattan is not too noisy and not too quiet. It just suits me.

agree strongly	agree	neutral	disagree	disagree strongly

(5) As far as feeling safe when I go out by myself is concerned, Manhattan suits me fine.

agree strongly	agree	neutral	disagree	disagree strongly

(6) People have many different forms of recreation. As a whole, the recreation offered in Manhattan suits me just fine.

agree strongly	agree	neutral	disagree	disagree strongly

(7) Some people prefer a town that has a fast pace with many activities and events occurring constantly. Others prefer a quiet and peaceful town. There is not enough activity in Manhattan to suit me.

agree strongly	agree	neutral	disagree	disagree strongly

(8) I can travel around in Manhattan well enough to suit me.

agree strongly	agree	neutral	disagree	disagree strongly

(9) I am satisfied with the entertainment, such as movies, night clubs, etc. offered in Manhattan.

agree strongly	agree	neutral	disagree	disagree strongly

(10) If the opportunity presented itself, I would prefer living in another town.

agree strongly	agree	neutral	disagree	disagree strongly

(11) Please rank the last 3 towns or rural areas in which you have lived *in order of preference.* Include Manhattan as one of these 3 areas. Number 1 should be the area you most prefer.

1.

2.

3.

(12) List what you think the advantages and disadvantages are of living in Manhattan. Even if an advantage or disadvantage has been covered in a question *already, feel free to mention it here.*

Advantages Disadvantages

(13) Employment status: employed

unemployed

retired

(14) I receive the following monthly income:

0-$200	$501-$600	$901-$1,000
$201-$300	$601-$700	$1,001-$1,200
$301-$400	$701-$800	$1,201-over
$401-$500	$801-$900	

APPENDIX B

SAMPLE GROUP DEMOGRAPHIC DATA

Sex of Respondents

Sex	Frequency	Percent
Male	18	41.9
Female	25	58.1
Total	43	100.0

Age of Respondents

Age	Frequency	Percent
15-19	3	7.0
20-24	7	16.3
25-29	5	11.6
30-34	0	0.0
35-39	4	9.3
40-44	6	14.0
45-49	5	11.6
50-54	2	4.7
55-59	2	4.7
60-64	2	4.7
65-69	1	2.3
70-74	2	4.7
75+	4	9.3
Total	43	100.0

Mean = 40-44

Race of Respondents

Race	Frequency	Percent
White	36	83.7
Black	4	9.3
Mexican-American	2	4.7
Other	1	2.3
Total	43	100.0

Education Level

Education Level	Frequency	Percent
Completed 8th grade	4	9.3
Completed high school	13	30.2
Completed 2 years of college	12	27.9
College graduate	9	20.9
Post graduate work	5	11.6
Total	43	100.0

Mean = completed 2 years of college

Length of Residence

Length of Residence	Frequency	Percent
Less than 1 year	5	11.6
1-2 years	3	7.0
2-4 years	4	9.3
4-6 years	1	2.3
6-8 years	2	4.7
8-10 years	3	7.0
10+ years	25	58.1
Total	43	100.0

Mean = 6-8 years

Marital Status

Marital Status	Frequency	Percent
Married	23	53.5
Single	16	37.2
Widowed	4	9.3
Total	43	100.0

Employment Status

Employment Status	Frequency	Percent
Employed	22	51.2
Unemployed	14	32.6
Retired	7	16.3
Total	43	100.0

Income

Monthly Income	Frequency	Percent
No Answer	6	14.0
0-$200	14	32.6
$201-$300	0	0.0
$301-$400	3	8.1
$401-$500	4	10.8
$501-$600	4	10.8
$601-$700	1	2.7
$701-$800	4	10.8
$801-$900	2	5.4
$901-$1,000	0	0.0
$1,001-$1,200	0	0.9
$1,201 +	5	13.5
Total	37	100.0

Mean = $401-$500

APPENDIX C

SATISFACTION INSTRUMENT RESULTS

(1) I am satisfied with Manhattan's physical appearance

Answer	Value of Answer	Frequency	Percent
Agree strongly	5	1	2.3
Agree	4	26	60.5
Neutral	3	12	27.9
Disagree	2	4	9.3
Disagree strongly	1	0	0
Total		43	100.0

Mean = 3.5 (Value)

(2) I am satisfied with the friendliness of the people in Manhattan

Answer	Value of Answer	Frequency	Percent
Agree strongly	5	7	16.3
Agree	4	30	69.8
Neutral	3	6	14.0
Disagree	2	0	0
Disagree strongly	1	0	0
Total		43	100.0

Mean = 4.0 (Value)

(3) The size of Manhattan just suits me.

Answer	Value of Answer	Frequency	Percent
Agree strongly	5	11	25.6
Agree	4	18	41.9
Neutral	3	6	14.0
Disagree	2	8	18.6
Disagree strongly	1	0	0
Total		43	100.0

Mean = 3.7 (Value)

(4) Manhattan is not too noisy and not too quiet. It just suits me.

Answer	Value of Answer	Frequency	Percent
Agree strongly	5	3	7.0
Agree	4	31	72.0
Neutral	3	6	14.0
Disagree	2	3	7.0
Disagree strongly	1	0	0
Total		43	100.0

Mean = 3.8 (Value)

(5) As far as feeling safe when I go out by myself is concerned, Manhattan suits me fine.

Answer	Value of Answer	Frequency	Percent
Agree strongly	5	4	9.3
Agree	4	20	46.5
Neutral	3	9	20.9
Disagree	2	10	23.3
Disagree strongly	1	0	0
Total		43	100.0

Mean = 3.4 (Value)

(6) As a whole, the recreation offered in Manhattan suits me just fine.

Answer	Value of Answer	Frequency	Percent
Agree strongly	5	2	4.7
Agree	4	23	53.5
Neutral	3	6	14.0
Disagree	2	11	25.6
Disagree strongly	1	1	2.3
Total		43	100.0

Mean = 3.3 (Value)

(7) Some people prefer a town that has a fast pace with many activities and events occurring constantly. Others prefer a quiet and peaceful town. There is not enough activity in Manhattan to suit me.

Answer	Value of Answer	Frequency	Percent
Agree strongly	1	1	2.3
Agree	2	9	20.9
Neutral	3	11	25.6
Disagree	4	19	44.2
Disagree strongly	5	3	7.0
Total		43	100.0

Mean = 3.3 (Value)

(8) I can travel around in Manhattan well enough to suit me.

Answer	Value of Answer	Frequency	Percent
Agree strongly	5	5	11.6
Agree	4	32	74.4
Neutral	3	2	4.7
Disagree	2	4	9.3
Disagree strongly	1	0	0
Total		43	100.0

Mean = 3.9 (Value)

(9) I am satisfied with the entertainment, such as movies, night clubs, etc. offered in Manhattan.

Answer	Value of Answer	Frequency	Percent
Agree strongly	5	2	4.7
Agree	4	22	51.2
Neutral	3	7	16.3
Disagree	2	8	18.6
Disagree strongly	1	4	9.3
Total		43	100.0

Mean = 3.2 (Value)

(10) If the opportunity presented itself, I would prefer living in another town.

Answer	Value of Answer	Frequency	Percent
Agree strongly	1	4	9.3
Agree	2	7	16.3
Neutral	3	9	20.9
Disagree	4	16	37.2
Disagree strongly	5	7	16.3
Total		43	100.0

Mean = 3.3 (Value)

(11) Please rank the last 3 towns or rural areas in which you have lived in order of preference. Include Manhattan as one of these 3 areas. Number 1 should be the area you most prefer.

Position of Manhattan	Value	Frequency	Percent
1	5	29	67.4
2	3	6	14.0
3	1	8	18.6
Total		43	100.0

Mean = 3.9 (Value)

(12) List what you think the advantages and disadvantages are of living in Manhattan. Even if an advantage or disadvantage has been covered in a question already, feel free to mention it here.

Answer	Frequency	Percent
-10	1	2.3
-5	5	11.6
0	17	39.5
5	10	23.3
10	8	18.6
20	1	2.3
30	1	2.3
Total	43	100.0

Descriptive Statistics of Total Satisfaction Scores

Mean	42.9	Maximum	78
Median	43.2	Minimum	22
Standard Deviation	11.3	Range	56
Variance	128.3		

APPENDIX D

RESULTS OF MENTAL MAP MEASURES

Structure of Mental Maps

Level of Structural Quality	Frequency	Percent
1	0	0
2	9	20.9
3	24	55.8
4	10	23.3
Total	43	100.0

Mean = 3.0 (Level of precision)

Accuracy of Mental Maps (Per Cent Fit)

Mean	62.5	Maximum	93.2
Median	68.1	Minimum	3.3
Standard Deviation	23.1	Range	89.9
Variance	532.4		

Density of Mental Maps

Mean	20.9	Maximum	51
Median	19.0	Minimum	4
Standard Deviation	11.5	Range	47
Variance	133.4		

THE RELATIONSHIP OF KNOWLEDGE OF THE URBAN PHYSICAL ENVIRONMENT AND SATISFACTION WITH THE URBAN ENVIRONMENT

by

MICHAEL E. HUNT

B.A., University of Arkansas, 1971

AN ABSTRACT OF A MASTER'S THESIS

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Department of Regional and Community Planning

KANSAS STATE UNIVERSITY
Manhattan, Kansas

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The hypothesis of this study is that knowledge of the urban physical environment may be used as a partial predictor of satisfaction with one's urban environment. The study was conducted in Manhattan, Kansas, and a random sample (N = 43) was selected from the 1973 census of population.

Knowledge of the urban physical environment is defined as that knowledge which allows the individual purposeful mobility within the city. Purposeful mobility entails the recognition of where one is in the city, the ability to predict what will happen next, the evaluation of whether this action will be good or bad, and the action itself.

Satisfaction with the urban environment as a whole is the extent to which an individual is pleased with the city in which he or she lives.

Knowledge is measured with the use of mental maps drawn by each respondent. In order to measure mental maps in an objective manner, three dimensions of mental maps were determined: density, accuracy, and structure. Density is defined as the extent to which a mental map is packed with detail. Accuracy is the mental map's congruence with the objective plan of the city. Structure refers to the manner in which parts of the mental map are arranged and interrelated.

Density is operationally defined by literally counting the number of paths, edges, districts, nodes, and landmarks that each *mental map* contains.

Structural quality is measured by placing each mental map into one of four categories which are ranked on a continuum of increasing structural precision.

Accuracy is operationally defined by determining the degree of correspondence between the patterns of sixteen specific locations on an objective

map of the city and the respondent's sketch map. The degree of correspondence is termed the "per cent fit" and is given in the form of a per cent.

Satisfaction with one's urban environment is operationally defined by a series of questions whose coded values are summed in order to arrive at a measure along a continuum of increasing satisfaction. The questions used in this measure are derived from nine specific dimensions of satisfaction with the city in which one lives: (1) physical appearance, (2) friendliness, (3) size of city, (4) noise level, (5) safety, (6) recreation, (7) activity, (8) mobility in city, and (9) entertainment.

The nine dimensions are measured with a questionnaire in which the respondent indicates his degree of satisfaction or dissatisfaction to specific statements by a Likert-type scale. One rank-order question was asked in which the respondent ranked the last three cities or areas he or she has lived in in order of preference. One open-ended question was asked in which the respondent listed the advantages and disadvantages of living in Manhattan. And one question asked the respondent if he or she would prefer living in another town if the opportunity presented itself. These nine measures were shown to be internally consistent and thus reliable.

Multiple regression was calculated to determine if the three dimensions of knowledge of the urban physical environment could be used as one measure to predict satisfaction with the urban environment. It was found that knowledge could predict twenty-four per cent of the variance of satisfaction (significant at the .05 level). Therefore, the hypothesis is supported since the relationship was shown to be significant. However, the amount of variance in satisfaction found to be predicted by knowledge is less than had been expected. Therefore, rather than claiming support of the hypothesis, attention was

focused on the unexplained variance of satisfaction with the urban environment.