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Notes on Contributors:

Prof. G. Kay is Head of the Geography and Sociology Department at North Staffordshire Polytechnic, England.

Mr C.M. Rogerson is a Lecturer in Geography at the University of Witwatersrand, South Africa.

Miss S.D. Harvey is a Lecturer in Geography at the University of Zimbabwe.

Mr J. Beaumont is a Lecturer in Geography at Keele University, England.

Dr N.M.D. Mutizwa-Mangiza is a lecturer in the Regional and Urban Planning Centre, University of Zimbabwe.

Mr D. Mazambani is a Research Fellow at the University of Zimbabwe.

Mr J.R. Whitlow is a Lecturer in Geography at the University of Zimbabwe.

The authors alone are responsible for the opinions expressed in these articles. Articles intended for publication and all correspondence regarding Proceedings should be addressed to the Hon. Editor, c/o Department of Geography, University of Zimbabwe, P O Box MP 167, Mount Pleasant, Harare, Zimbabwe. (Tel. 303211-265).

MENTAL MAPS AND REGIONAL DEVELOPMENT PLANNING:

A ZIMBABWEAN CASE STUDY

by

N M D Mutizwa-Mangiza

> That every person's image of the world is unique is a truism so banal that it can lead to no useful analysis. It is as though a botanist declared every leaf of a tree to be unique, or a physicist noted that no atom was exactly like another. Both would be correct, but neither would gain very much understanding about leaves and atoms. (Gould and White, 1974, p51).

INTRODUCTION

How shall skilled manpower be spatially allocated in such a way that its services are made available to those areas most in need of them? This is one of the major regional development planning and administrative problems which most underdeveloped countries have to grapple with.

In the underdeveloped world, a process of rapid rural-to-urban migration is taking place, much more rapid than the growth of urban jobs. This process is reinforced by the parallel existence of two 'cultures' whose modes of living are significantly different, the traditional rural subsistence culture on the one hand and the urban money-centred on the other.

In general, the resultant pattern emerging from the multifarious development factors has been one of differential growth, with the urban areas growing much faster than the rural areas in terms of both general economic and population growth. It has been claimed in particular that the striking mass exodus of population from the rural to the urban areas has deprived the rural areas of a substantial amount of skilled manpower and of the most productive sector of the population (Chavunduka, 1976). At the same time, the urban areas have been burdened with overcrowded and unemployed populations striving to squeeze a living out of the squalid and hostile environments of the shanty towns, the barrios, the favelas and the bidonvilles.

Geographers, regional economists and planners alike have identified this

dual structure as one of the most challenging problems of development planning in the underdeveloped world, and in economic development parlance have described and presented it as a "core-periphery" and "cumulative causation" problem-situation (Friedman,1966 and Myrdal, 1957).

In spite of the fact that in most underdeveloped countries the rural population frequently exceeds 70% of the national total, urban areas are comparatively the locational loadstones, their powerful magnetic fields and bright lights attracting the majority of the rural population. The younger generations in particular aspire to break away from the shackles of rural life and escape into the urban areas.

Gould's work in Tanzania (1969), which in fact provided the initial inspiration for the present study, dealt with this urban bias problem and tried to measure its seriousness through mental mapping. A mental map was constructed from the ranking of Tanzanian regions by a sample of students from the national university in Dar-es-Salaam. The results indicated a very high preference for the urban areas and the regions immediately around them in contrast to the lowly ranked remote rural areas. Another map which Gould termed the "modernisation surface" was also made. Since "modernisation" is a very general term embracing variables which are not entirely orthogonal, 'urbanisation level' tends to be a fairly accurate surrogate of modernisation, so that in Gould's work the Tanzanian modernisation surface closely approximated the spatial variation in the level of urbanisation. The results showed a significant correlation between the university students' mental map and the modernisation surface. For a country rather poorly endowed in terms of natural resources, short of skilled manpower, of a predominantly rural population and trying to achieve a rural-oriented decentralisation development programme, this urban bias situation presents a formidable problem.

In Nigeria, (Gould and Ola, 1970) and in Ghana (Gould and White, 1974), mental maps constructed from views of sample students demonstrated essentially the same trends and patterns, that is, urban 'peaks' and rural 'sinkholes' of perception. Outside the African continent, the work of Leinbach (1972) in Malasia revealed the strong effect of ethnic differences, with Malay students on the one hand and Chinese students on the other consistently assigning high perception scores to different areas, but on the whole both groups of students ranking urban areas higher than rural areas. This is representative of only a few of the accessible literature on the application of mental maps to planning in underdeveloped countries.

The purpose of the present study is to demonstrate how the mental mapping method may be used in regional development planning, particularly in the national manpower planning sector. Simply put, the mental mapping postulate which this study aims to test is: 'If the results of perception, that is ranking of m regions of a country by an adequately large sample of n individuals are analysed, it can be demonstrated that, more often than not, there will be a significant common or shared view'. Having tested this postulate using data from a sample of Zimbabwean secondary schools, the manner in which mental mapping may be integrated into the whole process of regional development planning is demonstrated.

METHODOLOGY

A questionnaire consisting of a map of Zimbabwe divided into its seven administrative regions (provinces) was used for obtaining the data. The regions used in the map were; (1) North Mashonaland, (11) South Mashonaland, (111) Midlands, (1V) Manicaland, (V) Victoria, (V1) South Matebeleland, and (V11) North Matebeleland. The students were asked to rank these regions, imagining that they had finished their education/training and were about to choose an area to settle down for a job. The ranking simply involved jotting down numbers in provided boxes below the map. The map also showed the location of major towns to help the students know which towns come under which regions. Originally, it was intended to choose a sample secondary school from each of the seven regions so as to achieve adequate spatial representation in the sample population. However, travel difficulties and financial constraints made this impossible. In the end the survey was carried out in five former 'African secondary schools', that is; (1) Mazoe Secondary School, located in Region 1; (2) Harare Secondary School and (3) Mufakose Secondary School, both located in Region 11; (4) Luveve Secondary School and (5) Mzilikazi Secondary School, both located in Region V11. The major contrast is between those schools which are located in Mashonaland and those located in Matebeleland. Particularly two factors concerning the two regions, North Matebeleland and South Mashonaland are significant:

(a) the most important and largest cities are located here, Harare and Bulawayo; the former being the largest and capital city and the latter being the second largest city in the whole country.

(b) the two areas are ethnically different in-terms of language and culture - Matebeleland being dominantly of the Ndebele speaking people and Mashonaland of the Shona speaking people.

A sample of 20 students, both boys and girls (although Mazoe was only a boys' secondary school), was chosen randomly from classes studying for their Cambridge School Certificate (O level) and the questionnaires distributed for answering. The ages of the students raged between 15 and 18 years. Altogether, the sample population amounted to 100 students. The sample of 20 from each school represented between 5% and 6% of the total population of the school. The answering session took anything between 20 and 35 minutes, after which the questionnaires were collected and each student assigned a code number, that is, numbers 1 to 20 for each school.

A multivariate statistical technique, principal components analysis, was used in the construction of the mental maps. Since this method is now common, having been used widely particularly by geographers, the following account is just a summary of the five stages basically involved in the method. (See Figure 1).

The first stage involves construction of an original data matrix $\underset{\sim}{A}(m \times n)$ in which m are the units of observation and n are the variables. In this case m represents the seven regions of Zimbabwe and n are the 20 sample students from each sample school upon which the desirabilities of the m regions are measured. The columns of the matrix contain the rank numbers assigned to each of the seven regions by each of the 20 students, that is, the raw data is placed into matrix form without any transformation. Thus matrix $\underset{\sim}{A}(m \times n)$ contains data on an ordinal scale. It has been demonstrated in fact that mental maps constructed from data on an ordinal scale are not different from those constructed on an interval scale. Above all, people seem to find it easier to rank preferences rather than assign interval measures.

The second stage involves construction of a correlation matrix $\underset{\sim}{B}$ from the original data matrix $\underset{\sim}{A}$. Since we are interested in determining the extent of similarity in people's ranking of regions, matrix $\underset{\sim}{B}$ indicates the correlation between every jth student's ranking of regions with every other of the $n - 1$ individual students. Thus matrix $\underset{\sim}{B}(n \times n)$ is both square and symmetric.

The third stage consists of the determination of a principal axis from the correlation matrix $\underset{\sim}{B}$ through a rotation procedure called "varimax orthogonal rotation" (See Taylor, 1977, p244). Figure 2 illustrates a geometrical representation of what is involved in the varimax orthogonal rotation procedure. The diagram is necessarily simplified since in actual fact it should be an n dimensional ellipsoid, but anything beyond two dimensions is difficult

Fig. 1 : The Five Stages in Mental Mapping through Principal Components Analysis

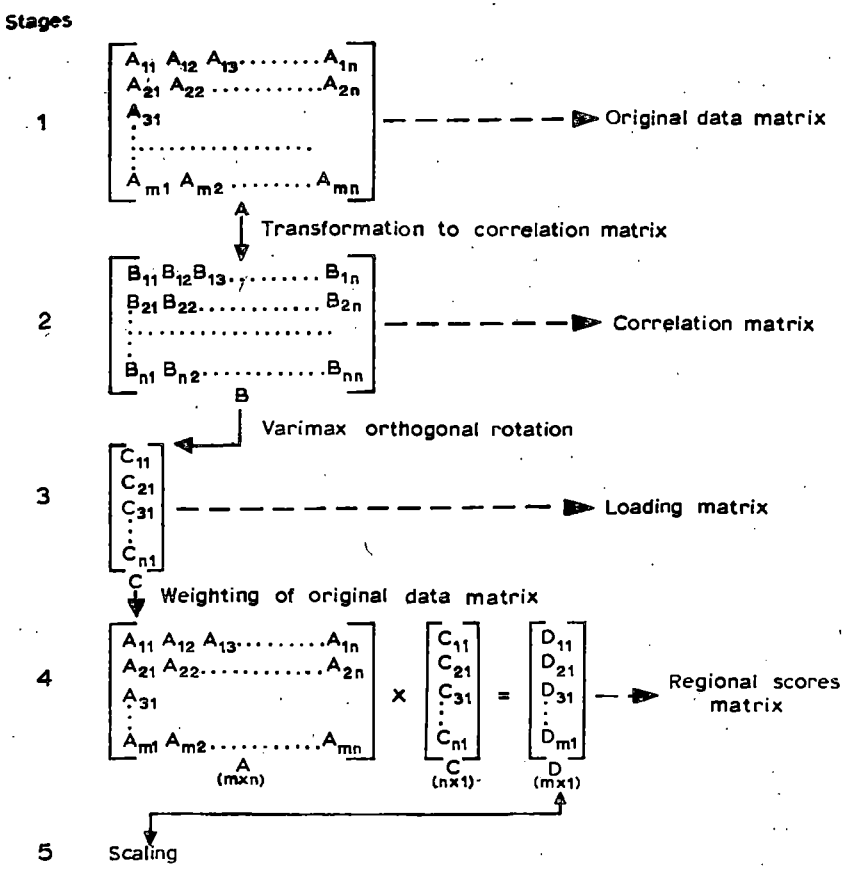
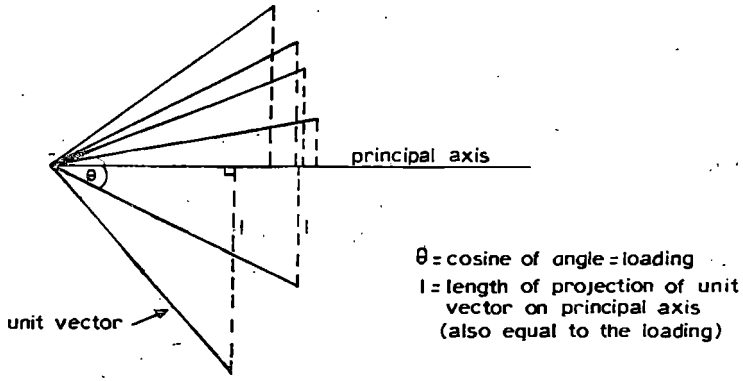


Fig. 2 : Position of the Principal Axis as determined through Varimax Orthogonal Rotation



to imagine or represent on paper. In this geometrical representation each jth student becomes a unit vector. The aim is now to determine the position of a principal axis which shall represent the most common or shared view. Once the position of the principal axis is determined each unit vector now 'loads' on the principal axis, and this value, the 'loading' represents the correlation between the jth student with the most common shared view. The loading is defined as the length of the projection which the unit vector makes on the principal axis or the cosine (O) of the angle between the unit vector and the principal axis, as shown in Figure 2. Determination of the position of the principal axis is achieved by rotating the principal axis until it gets to a position such that when we take each loading (l_j) and square it (l_j^2), this quantity ($\sum_{i=1}^{n} l_j^2$), which may be called lambda (λ), is maximised. The operation may be expressed formally as below;

$$\sum_{i=1}^{n} l_j^2 = \lambda \text{ is maximised} \qquad (1)$$

The quantity λ is in fact known as the 'eigenvalue' of the first principal component. Normally, in principal components analysis, a number of axes representing $\underline{k}$ dimensions or correlation structures are determined through the varimax orthogonal rotation procedure, coming out in the end with a new matrix $\underset{\sim}{C}$ (n x k) which consists of the loadings of each variable on the successive $\underline{k}$ principal components. Since in this particular case we are only interested in the first of the $\underline{k}$ dimensions, that is the most common or shared view, matrix $\underset{\sim}{C}$ (n x k) will in fact be a column vector consisting of $\underline{n}$ rows (number of students) and one column for the first principal component - $\underset{\sim}{C}$ (n x 1). What actually happens during the rotation procedure is a breaking down of the $\underline{n}$ variables (rankings of regions by students) into fewer $\underline{k}$ variables, or dimensions, or correlation structures which represent shared but different common views. These $\underline{k}$ dimensions are orthogonal, that is, unrelated, and the whole operation can be described as one intended to eliminate redundant variables or 'multicollinearity'. This is logical, since quite a number of students tend to agree with each other with respect to their regional preferences, and the task of analysis is made easier if such students are placed into successive, discrete groups which represent perception patterns. Thus the $\underline{k}$ principal components represent these successive different group perception patterns, with the first principal component - the only one in which we are interested in this particular instance - representing the most common shared view or perception pattern.

Finally, returning to equation 1: if the quantity λ, that is the eigenvalue, is expressed as a percentage of $\underline{n}$ (20), which is the total number of the variables or students, then we shall get the percentage of the variance explained by the first principal component (% explained variance in Figures 3 to 8). The % explained variance of the first principal component is a measure of the extent of agreement among the sample of students with respect to regional preferences. The greater the agreement the higher the eigenvalue and % explained variance, and the lesser the agreement the lower the eigenvalue and % explained variance. The % explained variance is thus a measure of the significance of each of the mental maps in question.

The scaled regional scores obtained for the six data sets were portrayed cartographically in the form of choropleth maps, (Figures 3 to 8). Normally results are portrayed in the form of isopleth maps, but in this case the regions used are too large and the interpolation of values, which is necessary for the construction of isopleths, would largely be guesswork.

RESULTS AND DISCUSSION

Figures 3 to 7 are the resulting mental maps of the five schools studied, and Figure 8 is the composite mental map derived from the first five mental maps.

School 1, Mazoe Secondary School: What is particularly striking about this mental map is that although the school is located in North Mashonaland, the most liked region is South Mashonaland (a score of 100) and North Mashonaland is in fact ranked fourth (39.57). The second most liked region is Midlands (74.61). Manicaland and North Matebeleland are assigned middle ranks (47.86 and 35.17 respectively), and the least liked regions are Victoria and South Matebeleland (12.93 and 0 respectively). On the whole, it can be said that there is a belt of high scores running from the east and north-east westwards, as the mental map illustrates fairly well.

School 2, Harare Secondary School: As in the case of school 1, the best liked region is South Mashonaland (100), followed by Midlands (58.22). Whereas in school 1 the difference between the first ranked and the second ranked regions is just 25.39, in school 2 the difference is much larger, that is 41.78, showing that in this case South Masonaland is ranked far higher above the others. It may be concluded therefore that students from school 2 strongly differentiate between the regions, attaching a lot of importance particularly to South Mashonaland. Manicaland and North Matebeleland occupy middle ranks (55.6 and 44.37 respectively), and are just a little

Mental Maps

Fig.3 : Mazoe Secondary School

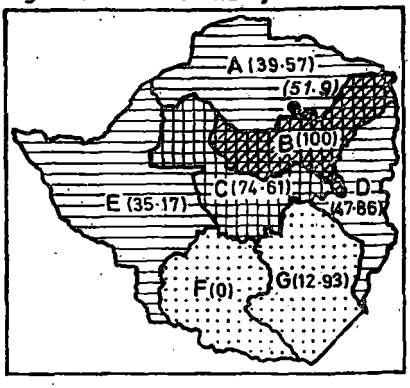


Fig.4 : Harare Secondary School

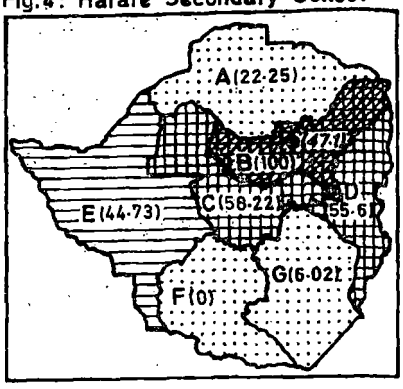


Fig.5 : Mufakose Secondary School

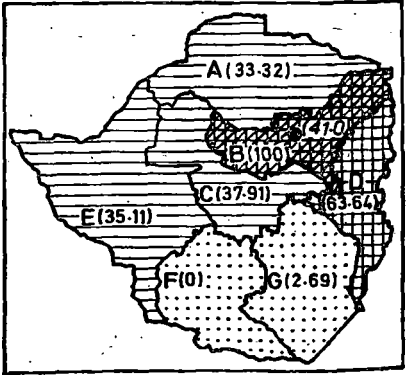


Fig.6 : Luveve Secondary School

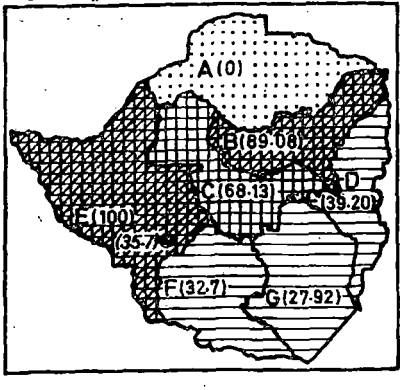
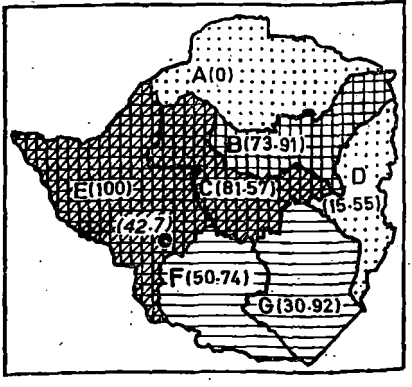


Fig.7 : Mzilikazi Secondary School



KEY

Isopercept Score

	0 - 25
	26 - 50
	51 - 75
	76 - 100

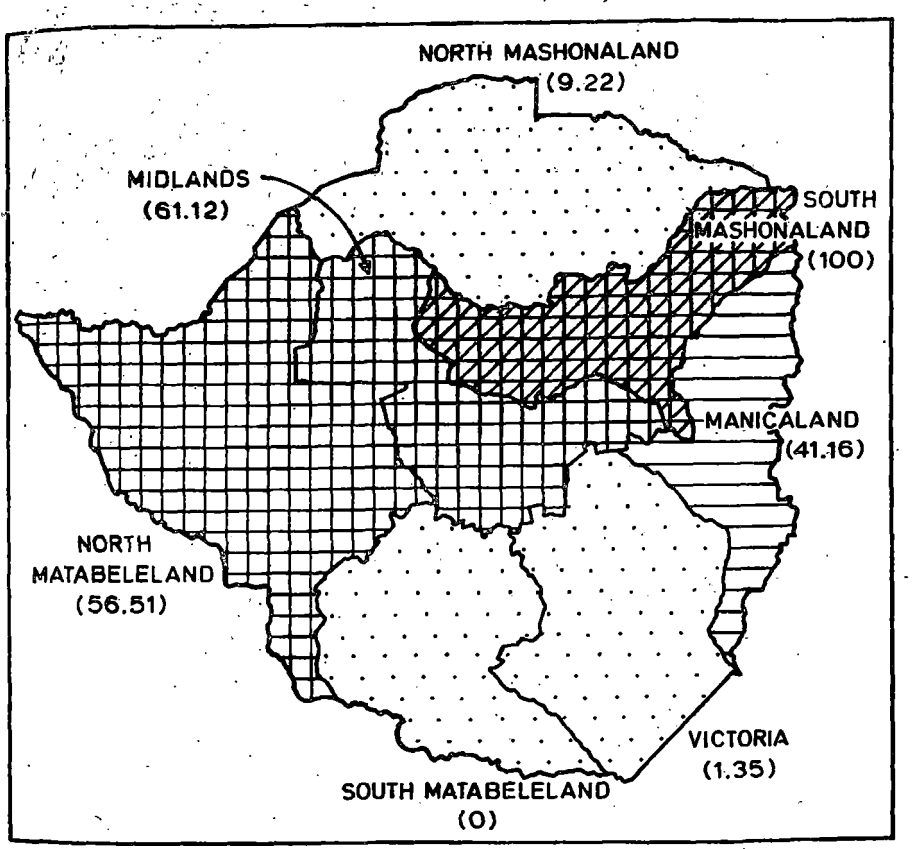
A	North Mashonaland
B	South Mashonaland
C	Midlands
D	Manicaland
E	North Matabeleland
F	South Matabeleland
G	Victoria
●	Location of Sample Schools
%	Explained variance *(51·9)*

Scale

0 200

kilometres

Fig. 8: Composite Mental Map



KEY

Isopercept score

0-25

26-50

51-75

76-100

Scale

0 100 200

kilometres

% Explained variance = 71.7

CT

At stage four, matrix $\underset{\sim}{A}$ (m x n), the original data matrix, is multiplied by matrix $\underset{\sim}{C}$ (n x 1), the loadings matrix, to get matrix $\underset{\sim}{D}$ (m x 1) as below;

$$\underset{\sim}{A}\ (m \times n) \times \underset{\sim}{C}\ (n \times 1) = \underset{\sim}{D}\ (m \times 1) \qquad (2)$$

$\underset{\sim}{D}$ (m x 1) is the matrix of scores for the m regions, and is in fact the solution of the whole operation. What has happened is that the original data matrix has been weighted by the loadings on the principal axis.

All that remains at stage five is the scaling of the regional scores. Since students ranked their choices in this order, 1, 2, 3 and so on down to 7, the best liked regions will tend to have low scores (negative) while those disliked will have high scores (positive). After scaling, the lowest ranked regions will have a score of zero and the highest a score of 100. The scaling is achieved using the following formula;

$$S_i = \frac{\left|X_i - X_b\right|}{X_b - X_s} \qquad (3)$$

where S_i = scaled score of region i

X_i = unscaled or raw score of region i

X_b = largest unscaled regional score

X_s = smallest unscaled regional score

The method of analysis described was applied to the five Zimbabwean data sets using the computer. For construction of the composite mental map, the five sets of results, that is regional scores of the five schools, were used as the original data matrix A, this time a 7 x 5 matrix, and then the operation described above was repeated. The only difference was in the scaling since the order of the original data matrix is in this case the reverse of the first five data sets, that is with the best liked regions having a score of 100 and the lowest zero. Instead of Equation 3, the following scaling formula was used;

$$S_i = \frac{\left|X_i - X_s\right|}{X_b - X_s} \qquad (4)$$

where all the terms are as in Equation 3.

behind the second ranked region. From these two regions there is a drop of 22.48 in scores to the least liked regions, North Mashonaland (22.25), Victoria (6.02) and South Matebeleland (0). Here, the east-west belt or ridge of high scores consisting of South Mashonaland, Midlands, Manicaland and North Matebeleland is much more distinct than in Figure 3, the mental map for school 1. The east-west belt is flanked to the north and south by lowly perceived regions of North Mashonaland, South Matebeleland and Victoria. The score difference between the east-west belt and the peripheral flanking regions is 22.48.

School 3, Mufakose Secondary School: Again, the best liked region is South Mashonaland (100), followed this time by Manicaland (63.64), and then Midlands (37.91), North Matebeleland (35.11), and North Mashonaland (33.32). South Matebeleland and Victoria are very poorly perceived (0 and 2.9 respectively). The east-west ridge of high scores is still discernible, though less pronounced than in the map for school 2 due to the fact that North Mashonaland is assigned a higher score this time.

School 4, Luveve Secondary School: The best liked region is North Matebeleland (100) in which the school is located. This is followed very closely by South Mashonaland (89.08) and Midlands (68.13). For the first time South Matebeleland and Victoria are assigned scores above 10, that is 32.7 and 27.92 respectively. This may be due to the neighbourhood effect, that is they are better perceived because of their close proximity to the location of the sample school. Manicaland also occupies a middle rank with a score of 39.08. The least liked region is North Mashonaland (0), which is very lowly perceived since there is a difference in scores of 27.92 with the second least liked region. On the whole the east-west belt of high scores is very distinct, as in the case of school 2.

School 5, Mzilikazi Secondary School: As in school 4, the best liked region is North Matebeleland (100), followed closely by Midlands (81.57), and by South Mashonaland (73.91). The east-west belt is again assigned very high scores. However, this time the belt excludes Manicaland (15.55). Again, as in school 4, South Matebeleland and Victoria are better perceived (50.74 and 30.92 respectively) - in fact the highest scores to be received by these two regions. North Mashonaland is given the lowest score (0).

The Mashonaland and Matebeleland Schools Compared: In both groups of schools the lowest ranked regions are North Mashonaland, Victoria and South Matebeleland, although the Matebeleland schools attach more importance to South

Matebeleland and Victoria than North Mashonaland, and similarly the Mashonaland schools attach more importance to the nearer North Mashonaland than to South Matebeleland and Victoria. Quite clearly, this must be due to the neighbourhood effect. However, this neighbourhood or distance effect does not seem to be significant in the case of the highly ranked regions. Thus in both groups, the east-west ridge of high scores emerges, and it is significant that the Matebeleland schools attach very high scores to South Mashonaland, that is 73.91 and 89.08, although the two regions are geographically far apart. This indicates a willingness among the Matebeleland school students to move to South Mashonaland in spite of some cultural differences and geographical distance. The Mashonaland schools similarly rank North Matebeleland fairly highly, assigning them middle rank scores ranging from 35.11 to 44.73.

The Composite Mental Map: On examining the composite mental map, Figure 8, the following characteristics may be isolated:

a) South Mashonaland (100) is ranked far above all the others, the second ranked region, Midlands having a score of 61.12, which is 38.88 below the former.

b) South Mashonaland with Midlands, North Matebeleland (56.51), and Manicaland (41.16) form an east-west belt or ridge of high perception scores. It is also this belt which is the most developed part of the country, generally, with thriving commercial farms in close proximity to the railway line, and industry in the towns. It also forms, topographically, the highland or watershed along which the major railway line runs from Mutare in Manicaland, through to Harare and Kadoma (South Mashonaland), KweKwe and Gweru (Midlands), to Bulawayo and then north to Hwange (North Matebeleland). Thus the major and oldest towns are concentrated in this belt, and connected by the oldest railway line in the country. The fact that this belt was assigned high scores is therefore more than coincidental.

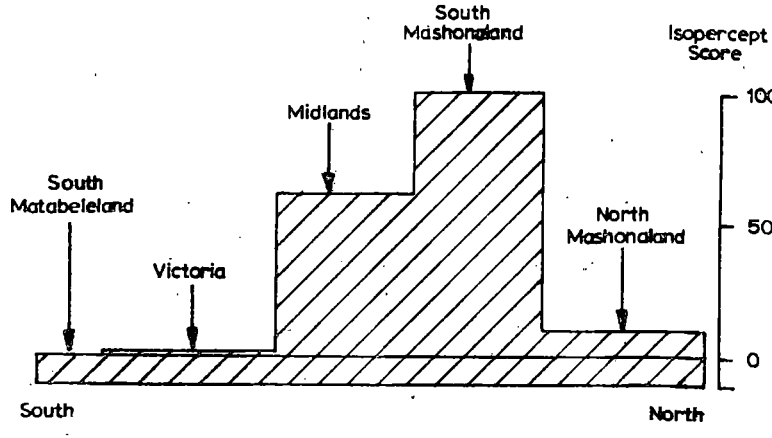
c) The east-west belt or ridge of high scores is flanked by lowly perceived regions, to the north by North Mashonaland (9.22) and to the south by South Matebeleland (0) and Victoria (1.35). Again, this is not coincidental since these are also the low-lying, rather hot and humid areas. Above all, they are generally the least developed. There are some towns such as Nyanda, Chiredze and Beitbridge, but these are comparatively small, and any development such as the Sabi-Limpopo irrigation complex does not seem to be sufficiently attractive to counter-balance the highly perceived regions in the north.

On the whole, there seems to be a fairly consistent pattern running through all the mental maps, and that pattern is summarised by the composite mental map. Figure 9 which shows two transects or cross-sections of the composite mental map visually heightens this general pattern. The first transect (i) runs from north to south through Harare and the second transect (ii) runs through Harare from east to west at right angles to the first. In both transects, the centre is South Mashonaland, the highest surface on the map, with scores or desirability declining outwards, but more so towards the north and south than to the west and east. The centrality of South Mashonaland is most likely due to the fact that Harare, the capital and largest city, is located here. Bulawayo, the second largest city, Gweru the third largest, and Mutare the fourth are located in North Matebeleland, Midlands and Manicaland respectively: these are bound to be locational loadstones, particularly as almost all the students interviewed prefered urban to rural areas, as shown in Figure 10. In a larger study, of which the present article is a part (Damson Mutizwa, 1979), the same students were asked to state their choice of place of work, between urban and rural areas. As Figure 10 shows, 97 percent of the students prefered to work in urban areas. Of the total number of students whose homes were in urban areas, none (0 percent) chose to work in the rural areas as the upper flow-arrow in the diagram shows, and of the total number of students whose homes were in the rural areas 93.62 percent chose to migrate to work in the urban areas as indicated by the bottom flow-arrow. The distributions of the five schools, that is urban/rural choice distributions, were tested against a theoretical distribution where it was assumed that half the total sample population would choose to work in urban areas and the other half would choose to work in rural areas. This theoretical distribution or assumption is of no empirical significance, apart from the fact that it splits the population into two equal halves making it possible to measure the extent of bias in the observed distribution. A chi square test was carried out, and as shown in the diagram, the observed pattern was found to be significantly different (urban biased) from the theoretical distribution at a very high significance level of 0.001.

Therewas, generally, a significant common perception pattern or shared view among all the five samples as evidenced by Table 1 which shows the respective % explained variances and eigenvalues of the first principal component which range from 35.7 percent (λ = 7.13) to 51.9 percent (λ = 10.38) for the five schools with respect to their preferences. It can be concluded therefore that the mental mapping postulate (see Introduction) held rather well in this situation. Table 1 compares favourably with Table 2, Gould's % explained

Fig.9 : Transects of the composite mental map

(i) The North-South transect :



(ii) The East-West transect :

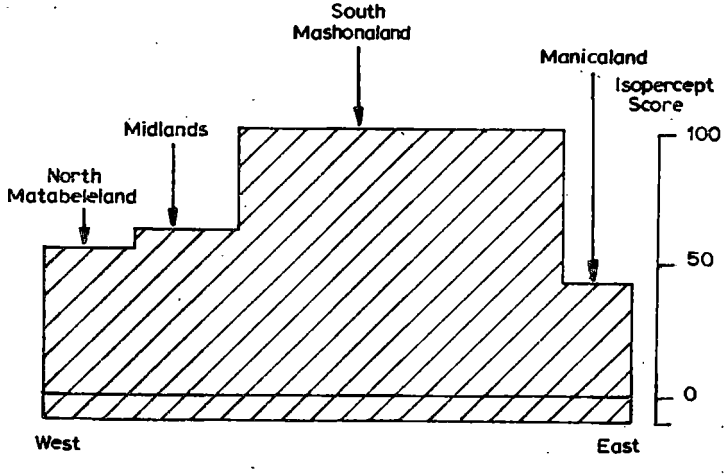
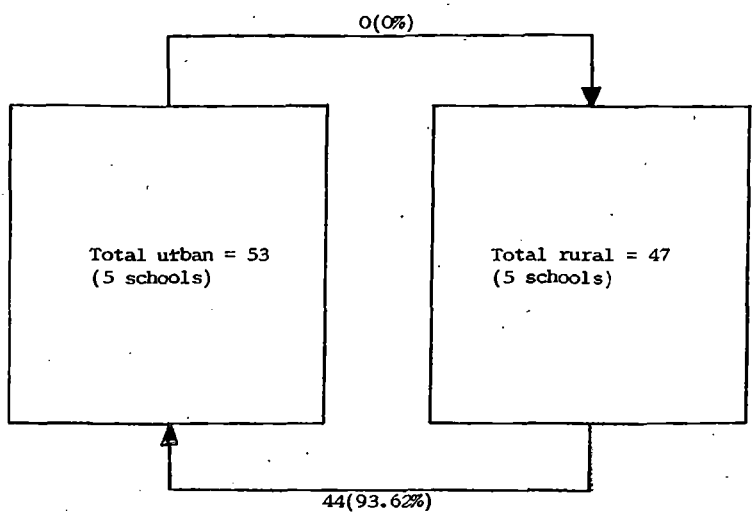


FIGURE 10

"Urban bias": Rural/urban migration on the basis of perception-aspiration results.



Urban/Rural ratio = 97:3

Observed pattern significantly "urban biased" at 0.001 significance level (α), the chi square (χ) being 44.5 where;

n = 5 i.e. total number of sample schools.

df = (n-1) = (5-1) = 4 degrees of freedom.

18.46 = the critical value of chi square (χ) at 0.001 significance level (α).

TABLE 1

Percent Explained Variances and Eigenvalues of the First Principal Component for the Six Results

Sample School	% Explained Var.	Eigenvalue (λ)
Mazoe	51.9	10.38
Harare	47.1	9.42
Mufakose	41.0	8.21
Luveve	35.7	7.13
Mzilikazi	42.7	8.55
Composite Mental Map	71.1	3.59

TABLE 2

Percent Explained Variances: Gould's USA Mental Maps

State	% Explained Variance
Pennsylvania	46
Minnesota	41
California	36
Alabama	28

Source: Gould, 1966 p. 18.

variances for USA mental maps.

CONCLUSION

In spite of the sampling inadequecies and difficulties outlined earlier, this study, it is hoped, has demonstrated that mental maps are of relevance to regional manpower planning for developing countries. The regional inequalities and the dual urban-rural spatial patterns which characterise developing countries seems to 'thrive' because of the existing spatial structures, and the way in which people perceive and proceed to act on the basis of their perception of these structures. The two interact in a reciprocal fashion, a mutual negative and positive feedback process in which the existing socio-economic structures influence people's perception patterns, and those perception patterns in turn either modify or reinforce the existing structures. In terms of development, the composite mental map and the two transects indicate processes which are likely to result in a sustained marginalisation of some regions, and of the rural areas vis-a-vis the urban areas. The degree of development polarisation and marginalisation, or concentration of human and natural resources in urban areas as compared to rural areas, will depend on the development strategy chosen, and on the priorities and values held by the society in question. However, in any country, regional inequality is undesirable. Through mental maps, it is possible to measure more precisely the ways in which people perceive the different regions, attaching high values to some and low values to others. Since it is desirable to strive towards regional equality, and since marginalised regions cannot develop without the necessary manpower, the improvement of people's images of the lowly ranked regions must be given some priority in manpower planning. Improvement of regional images may be achieved in the following ways:

a) improvement of the factors which account for the low perception scores of the marginal regions. The mental maps in the study say very little about the reasons why some regions are ranked high and others are ranked low. Such reasons have to be inferred. On the other hand, an independent survey aimed at investigating the factors which underlie spatial or regional perception would be helpful. Once the most influential factors have been identified then measures to improve the lowly ranked regions can be taken, bearing in mind these factors. Incentives for attracting skilled personnel to the rural areas might involve raising salaries of personnel employed in rural areas to a level sufficiently above urban salaries to be attractive. In this situation, we could expect the salary level surface to approximate the inverse of the

composite or national mental map, so that where there were 'sinkholes' and 'peaks' of perception there will now be 'peaks' and 'sinkholes' of salary level respectively. Other measures to attract personnel into the rural and remote areas might include provision of free accommodation, free electricity and water supply.

In Uganda, before the Amin social upheaval, it was compulsory for newly graduated medical doctors to serve "up country" in the rural areas for a number of years before finally deciding where to settle down for work. The new Zimbabwe Ministry of Health has expressed its desire to follow a similar system in respect of both nurses and medical doctors. However, such a solution must be only short term and is ultimately incapable of achieving the desired results. Thus quite clearly, these "stick and carrot" type measures in the manpower sector designed to improve the lot of the rural areas must be part of a larger long term programme aimed at achieving regional health by changing the underlying structural inequalities. This necessitates increasing capital investment, both overhead and industrial, in the lowly perceived regions: the former can be achieved through direct government action and the latter by making rural conditions more attractive for industrial location, for example, the provision of grants and rent rebates for industries which decide to locate in the marginalised areas while making rents and taxes higher in those areas which are already comparatively well off. Thus the new Zimbabwean 'Ministry of Economic Development Planning' rural oriented policy, as reflected in its ZIMCORD document and 'Growth with Equity' (February and March 1981 respectively), would appear to be highly appropriate.

b) Since the way in which people perceive the world around them is to an extent dependent upon the social milleau in which they grow, what phenomenologists have called "lebenswelt" (Warnock, 1970), that is the social values, priorities and aspiration patterns based on shared experience, improvement of the lowly perceived regions might involve an extensive educational programme. New values and images can be emphasised and diffused among the younger and growing members of the population, values and images particularly aimed at depolarisation and dispersal and counteracting the predominant urban-bias trends. Higher values might thus be attached to service in the rural areas within agricultural, health and educational professions. An increased effort can be made in schools to provide to the pupils information which will break down barriers of perception.

Finally, future work on mental maps and manpower planning should focus on individual professional groups, for example classes of university students training to be teachers, planners, engineers, doctors and agricultural professionals. Mental maps of such groups, being an objectification of the future and summarising expected 'spatial aspiration patterns', will contribute to the art of informed anticipation and manipulation of the future which we call 'planning'.

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