Communication and Cultural Development: A Multidimensional Analysis

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CLASSICAL SOCIOLOGICAL THEORY has been concerned with the process by which societies change from traditional agriculturally based systems to modern ones in which wealth is generated primarily through industrial production (Tönnies 1912; Durkheim 1960; Spencer 1897; Parsons 1961). This process has become known as development or, when dealing with a specific nation-state, national development. Despite the popularity of the terms "development" in the social science literature, little scholarly attention has been paid to the precise definition of this term. Each academic discipline (if not each individual researcher) uses and shapes the term as it is beneficial for each particular study without concern that the notion of development incorporates a number of dimensions from all the social sciences.

Rao has defined development as

the complicated pattern of economic, social, and political changes that take place in a community as it progresses from a traditional to modern status. These changes include political consciousness, urbanization, division of labor, industrialization, mobility, literacy, media consumption, and a broad general participation in nation building activities. [1967:7]

Clearly, development is a multidimensional construct including economic, political, educational, and social factors.

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While researchers would agree with this statement in theory, when it comes to the practice of measuring national development, this has not been the case. The variable development has been treated most often as being unidimensional rather than multidimensional. The most specific and mathematically precise definition has come from economics, where economists have used the gross national product (GNP) or GNP per capita as the specific indicator of development (Rogers 1978). Most noneconomic approaches have been forced to view their particular approach in terms of this economic variable. Typically, this has resulted in development being measured primarily in economic terms, to the exclusion of the other dimensions of development. Specifically, a certain amount of real dollars has become the acceptable international monetary unit for cross-national comparison.

Schramm (1964) utilizes such a definition. He defines a nation as being "underdeveloped" or as "developing" if the annual per capita income is $300 or less. This has also become the UNESCO criterion for underdeveloped nations. It is apparent that the sheer number of dollars as a cross-national comparison base is not desirable since many forms of development cannot be expressed in dollars and comparison in dollars is not relative to many nations. Even economists, such as the late E. F. Shumacher (1973:163-70) have questioned the dollar-measurement of development. Other scholars who may be placed into this category include Lerner (1958), Pye (1962), Lerner and Schramm (1967), and Adelman and Morris (1967). Their research has been reviewed by Wigand (1975) and Wigand and Barnett (1976).

Implicit in the notion of development is the concept of culture. As a society modernizes, its members' patterned activity, language, use of artifacts, and world view tend to become more similar to other "developed" nations of the world. Without providing a review of the theoretical literature on culture (a comprehensive review is provided by McPhail and Barnett 1977) the authors will take the position of Woelfel and Barnett (in press).

[T]he collective consciousness, i.e., that aggregate psychological configuration which constitutes the culture of a society and toward which individual beliefs may seem to tend, may be represented accurately as the average matrix S, where any entry sij, is the arithmetic mean conception of the distance or dissimilarity between objects i and j as seen by all members of the culture.

These objects may be abstract aspects of belief, attitude, ritual, and patterned activity including such things as language, religion, or the nation-state. Typically, they are de-

fined in relation to the self, the individual member of the social system. It is this representation of culture that this article will use as the theoretical basis for the measurement of culture. This has been discussed in greater depth by Wigand and Barnett (1976), and will be discussed further in the methods sections of this article.

There have been a number of attempts to move away from cross-national comparison through monetary units, by comparing various objective properties of different cultures. One comprehensive example of this has been the Human Relations Area Files (1969), which describe over a thousand cultures with 79 major and 631 minor variables dealing with patterned human activities. Typically, the measurement of cultural attributes entails the collection of data on particular structural or economic variables, which are then compared and cultural differences inferred. The UNESCO Surveys (1972) and the social indicator movement (Russet, Alker, Deutsch, and Laswell 1964) are probably the best examples of this style of research. The social indicator movement as expressed by Sheldon and Moore (1968), provides a system of social indicators that is established once variables whose empirical features and developmental conditions are identified and whose contributions to the overall condition of society are specified.

A particular branch of the social indicator movement, proposed by Gerbner (1969) and demonstrated by Gerbner and Gross (1976), places emphasis on cultural indicators. This system of analysis is based on the conception that trends in the composition and structure of mass media messages can be described. These message systems constitute the common culture through which societies cultivate shared, publicly held ideas about facts, values, and contingencies of human life. Any change in the social bases and economic goals of mass-mediated messages results in a transformed common symbolic environment. The realized change in this environment has social meaning such that it directs human activity. Gerbner suggests four standard category classes: (1) attention, (2) emphasis, (3) tendency, and (4) structure. This scheme, Gerbner admits, allows the researcher merely to narrow some of the gaps since "no comprehensive and comparative studies of the kind that might yield the cultural indicators needed for a realistic assessment of the much-debated condition of man in modern 'mass-cultures' exists" (1969:132). The assessment of cultural indicators is a move in the right direction toward establishing a method that allows for the representation of development. Unfortunately, such a technique does not allow for methodological rigor or powerful analyses that make precise prediction and explanation possible. In particular the attempted representation of various process notions through cultural indicators is limited.

There have been a number of comparative subjective cultural research projects based on Osgood's cognitive and psycholinguistic theory which argues that a connotative meaning can be expressed with three dimensions: evaluation, potency, and activity. The location of an object in "affective semantic space" is determined simultaneously by its value on these dimensions. A symbol's subjective meaning may be evaluated by its location when generated with Osgood's "semantic differential scale" (Osgood et al. 1957). Cultural variation in meaning may be attributed to how translated equivalents for

social objects are differentially situated in the average space of each society.

Osgood (1974) reports research into the semantic structure of 27 different cultural groups. The results produced loadings in the .80 to .90 range on the evaluative dimension, loadings from the .40s to the .70s for the potency factor, and for the activity dimension, .30 to .70. From these results, Osgood concludes, "This is rather convincing evidence for the universality of the affective meaning system" (1974:33-34).

Despite the apparent generality of the affective semantic space and its utility as a theoretical and methodological device (the semantic differential scale), there are serious shortcomings that render it less than ideal in the study of cultural change (Wigand and Barnett 1976). The three reported dimensions are largely an artifact of the data collection procedures. They do not emerge from the data. The space that results from the semantic differential scale has limited variance that homogenizes all the different cultures. Also, it limits possible cultural change in any one society. The semantic differential is incapable of precise measurement of cultural change and, therefore, it is impossible to calculate rates of change. Additionally, the space is discontinuous at zero. Finally, it tends to look at stimuli in isolation rather than as an integrated whole. However, metric multidimensional scaling, as a processual measurement technique, has none of these drawbacks. As will be seen later, it is capable of measuring subjective cultural definitions that can be used to study cultural change, that is, development in a manner that is theoretically consistent with the theoretical definition of culture proposed by Woelfel and Barnett (1974).

One of the most important research questions in the area of intercultural communication concerns the role of the mass media in the process of national development. While there are a number of models that attempt to describe the media's relationship to this process (Lerner 1958; Rogers 1960, 1969, 1971; Russet et al. 1964; Fagen 1966; Alker 1966; McCrone and Cnudde 1967; Winham 1970) none of them provides an unequivocal picture. A complete discussion of these models is provided by Frey (1973). One reason for this problem may be that the media are changing simultaneously along with the other factors of development. This makes causal modeling of the relationship between the mass media and development more difficult, and necessitates a research strategy that can measure these factors simultaneously. Likewise, time series analysis (Winham 1970) has been proven unable to accurately assess these models. This is due in part to the lack of sufficient data over time.

A related research question concerns media's effect on cultural processes. That is, how does the form and content of the mass media alter the patterned activity of the members of society as the social system achieves modern status? McLuhan (1964), extending the work of Innis (1951), has argued that the form of communication technology has profound implications for the culture of a society in terms of its members' world view, use of artifacts, and even the way in which they process information. Gerbner (1969) has suggested that the content of the media has implications for the culture of a society. Indeed, McClelland (1961) has demonstrated that the messages in the media have an effect on the culture of society and economic development.

In terms of the definition of culture proposed by Woelfel

and Barnett (1974), one must examine the simultaneous relationship between the various mass media and other cultural objects, such as the nation-state, other institutions of society (economic, educational, religious), the self-conception, and the values of the members of the society under investigation. If measured over time, it then becomes possible to describe the cultural development of a society. When a number of societies are studied in this manner, cross-national comparison is made possible, facilitating the creation of models of the media's role in development.

Methods

The dynamic nature of culture and the effects over time of the mass media on a social system may be measured through metric multidimensional scaling (Woelfel 1974; Barnett 1974, 1978; Woelfel and Barnett 1974, 1977; Wigand and Barnett 1976; McPhail and Barnett 1977). Briefly summarized, their argument goes as follows. The meaning of any set of concepts may be represented by an $N \times N$ dissimilarity (distance) matrix. Each row (vector) of the matrix describes the definition of a concept, which is defined as the symbol's relationship to all the other concepts. These data are generally gathered by a series of direct-paired comparisons. This distance matrix provides a static picture of the interrelationships among a set of concepts possessed by a single individual. The collective consciousness (Durkheim 1951), that aggregate psychological configuration that constitutes culture, may be represented as the average distance matrix generated from a representative sample of the population of the society under investigation. Process can be recorded in successive matrices as known time intervals and the changes between the matrices calculated.

While these matrices are accurate representations of a social system's culture, they are extremely cumbersome due to their size. In order to reduce the data to usable proportions, MDS is applied. Given the above dissimilarity matrix, mathematical models exist that provide an interpretation of this psychological distance in terms of multidimensional Euclidean geometry. The concepts are treated as points in a spatial manifold, and techniques are available to obtain the dimensionality of this space as well as the location of the particular concepts on these dimensions (Torgerson 1958). The process is mathematically identical to converting a matrix of mileage distances among cities to a graphic representation such as a map. In that special case, an $N \times N$ table of cities may be described with the loss of little information in a reduced two-dimensional space. After a series of spaces has been generated at separate points in time, they may be rotated to a solution that minimizes the squared distance between the theoretically stable concepts (Woelfel et al. 1975). Analogously, it becomes possible to concentrate on the motion of particular dynamic cultural concepts. A computer program (Galileo Version 4) accomplishes the necessary calculations described in this paper.

G. C. Chu (1964) has suggested that quantitative judgments such as direct paired comparisons might be too difficult for non-Western and/or illiterate subjects. This may result in erroneous interpretations of the data. Osgood (1974) reports theoretically consistent results in 27 different cultures, using the semantic differential scale. It may be suggested that if subjects can complete semantic differential scales, then they should have no difficulty with direct paired comparisons. Indeed, multidimensional scaling has been used successfully with subjects from non-English-speaking cultures. The languages in which the research has been conducted were Japanese (Kuno

and Suga 1966), Dutch (Van Der Kamp and Pols 1971), Swedish (Ekman 1955; Hanson 1963), Finnish (Nordenstreng 1968), Spanish (D'Andrade et al. 1972), and French (Barnett 1977a, 1977b).

Heider and Olivier (1972) used MDS for cross-cultural comparisons to test the Whorfian hypothesis concerning the relation between cognitive and linguistic structure. Subjects from the United States and the Dani culture of New Guinea were asked to perform two tasks. One involved scaling color names and the other scaling Munsell color chips. MDS on the four data sets yielded structures that were more similar under the cognitive conditions than the naming condition. In neither culture were distinct colors confused in memory more than across name boundaries. Thus, retention of color images appears to be unaffected by cultural differences in the semantic reference of color words.

The current study is designed to determine the effects of the mass media on culture. Explicitly, the researchers are interested in television's impact on traditional institutions (family and church), values (prosocial and antisocial behavior), and interpersonal behavior in a number of different societies which are varied with regard to language, level of development, and type of media system.

Because the study was designed to measure the impact of the mass media on various components of culture, the following concepts were scaled: 1) Friends; 2) Male; 3) Television; 4) Film-Cinema; 5) Newspapers; 6) Fighting; 7) Trustworthiness; 8) Religion; 9) Female; 10) Family; 11) Helping; 12) Radio; 13) Credibility; 14) Intelligence; and 15) Me.

The inclusion of the media items (television, film-cinema, newspapers, and radio) makes possible the measurement of the interaction with other concepts, traditional institutions (religion and family), values (fighting, trustworthiness, and helping, and credibility), and self-conception (friends, male, female, intelligence, and me). This allows the researcher to measure the impact of the media on these cultural objects.

Subjects were asked to compare all possible pairs of these terms, 105 comparisons, against a criterion standard (unit of measure) of Red and White as 100 galileos (units). These pairs were placed on a pencil and paper instrument along with the instructions. For the non-English portions of the sample, the entire questionnaire was translated into the national language.

The sample of cultures for this study currently includes the United States, the Republic of South Africa, Mexico, Australia, Micronesia, and Israel. Thus, the languages in which data were collected include English, Spanish, and Hebrew. Since this is an ongoing study, future sample sites are planned to increase the variance in language, media system, and level of development.

The data collection site in the United States was Michigan State University, East Lansing, Michigan. Sample subjects were students in an introductory communication course ($N = 47$). In Mexico, junior and senior communication students at Universidad Iberoamericana, Mexico City, constituted the sample ($N = 55$). The South African sample was composed of students from an introductory psychology course at Rand Afrikaans University in Johannesburg ($N = 31$). These data were gathered during the fall of 1974. During 1975, additional data were collected in Australia, Micronesia, and Israel. The data collection site in Australia was McQuarie University, North Ryde, New South Wales ($N = 56$). In Micronesia the data were collected from English-language high school students on the island of Majuro in the Marshall archipelago, a United States Trust Territory ($N = 60$), and the Hebrew

University in Jerusalem served as the site in Israel ($N = 87$).

The subjects were all students either at the university or high school level. Clearly, this group is not representative of the six cultures. Thus, the sample was opportunistic rather than representative. In addition, if university students, who are somewhat destined to be the opinion leaders of these societies, have a certain perception of the scaled cultural objects then one can expect the more general acceptance of these views in the future.

In order to compare the various cultures in the sample, the data need to be reduced to a set of summary statistics. The reason for this is because metric multidimensional scaling does not have a loss in information. The vector lengths (variance) and the angles between the vectors (the cosine of which is the correlation) are both retained. In traditional statistical analysis, the variance is usually controlled out by standardizing, thus allowing the use of the correlation as a summary coefficient. In the past, studies using metric multidimensional scaling to analyze the data have reported the means matrix for each group, the spatial manifold resulting from the scaling of the means matrices and the comparisons of these spaces after rotations have taken place (Barnett et al. 1976; Wigand and Barnett 1976; Barnett 1977b). As more sets of data are analyzed simultaneously, this practice becomes impractical. There is simply too much information for the reader (or researcher) to absorb when all the matrices are presented. As a result, procedures to summarize large amounts of multidimensional data are being developed. With over-time data, one can simply determine the trajectory of various concepts through the spaces. However, with static group comparisons, a different procedure is called for.

In this study the nations were compared in the following manner. The spatial manifolds from the six nations were rotated to a least-square congruence as if each data set represented a different point in time. Since the researchers had no additional information with regard to the relative stability of the concepts across cultural boundaries, all concepts were treated equally and included in the least-square solution. This was done for all possible pairs of nations, resulting in a $6 \times 6 \times 15$ matrix of the dissimilarity between the cultures for each concept. This was then reduced to a 6×6 matrix by averaging across the concepts. The resultant matrix could then be treated like any other square symmetrical matrix of discrepancies. The data were orthogonally decomposed. In a sense, this was a multidimensional analysis of the residual variance that was unexplained by the least-square best fit rotation. That is, after the maximal shared variance accounted for by the perception of the media system and its perceived effect on society were removed, the societies were again compared. The proportion of variance explained by the residual matrix is determined by the ratio of the trace of the residual inter-nation matrix to the sum of the traces of the individual national matrices. The residual variance was then scaled to reveal the dimensions unaccounted for by the previous analysis.

The societies may also be analyzed with cluster analysis. In this study hierarchical cluster analysis is to group together those scaled stimuli (in this case, nations) that are most alike. Such a grouping can aid in the interpretation of the dimensions by bringing together stimuli that are similar. This was done from the means distance matrix of the nations. Thus, the clusters were determined by the actual residual distance, (the 6×6 distance matrix) such that two countries that are closer together would appear in the same cluster and two nations that are far apart would be in a different group.

Results

In the interest of brevity, the individual means and spatial coordinate matrices, the rotated spaces, and the differences between each concept across the sample sites are not presented in this paper. However, they are available from the authors upon request.

The results of the spatial coordinate matrices can best be described as three-dimensional solutions. This was determined through the use of the scree test (Barnett and Woelfel,1976). In all cases, these were the first three real dimensions. The percent variance explained by these three dimensions ranged from 59% to 81%. For the U.S. sample, these dimensions explained 66.06% of the variance; for South Africa, 65.27%; Mexico, 81.94%; Micronesia, 73.37%; Australia, 59.65%; and Israel, 73.00%.

The scree test is a somewhat arbitrary procedure. Thus, the finding that the "best" solution for each space is three-dimensional is equivocal. As a result, no attempt at interpreting the three dimensions will be made. Because anywhere from 19% to 40% of the variance is still unaccounted for by the three dimensions, all k-1 (14) dimensions (100% of the variance) should be included in any further analysis (Barnett and Woelfel 1976). The least squares congruence were performed using all 14 dimensions.

The entire spaces were then rotated to a least squares congruence, removing the shared variance among the spaces, and then the discrepancies for each concept across the sample sites averaged to produce the 6×6 matrix of residual discrepancies between the nations presented in Table 1. The residual spaces account for only 6% of the total variance in these operations. Its trace was 1,422.63. The sum of the traces of the six individual spaces was 23,235.74. Thus, the mass media accounts for most of the shared variance among the nations. Systematic departures from the average discrepancies worth noting are *television* for the Mexican sample and *friends* for the Israeli sample. For Mexico, the average discrepancy of all concepts from the other nations was 22.62. However, for *television* alone, the average discrepancy was 32.87. For Israel, the overall average discrepancy was 36.04. For *friends* alone, 52.82.

The matrix was then scaled producing the coordinate system in Table 2. This is clearly a two-dimensional solution. These two dimensions explain 97% of the residual variance. They have been plotted in Figure 1.

In spite of arguing in the past against interpretation of the dimensions without regression analysis (see Barnett and Woelfel 1976), the first dimension may be labeled an English language dimension. At one extreme in this sample lie all the societies that speak English. At the other end is Israel. The data collection there took place in Hebrew, a semitic language that is clearly less similar to English than the Spanish language of

TABLE 1. MEAN DISCREPANCY MATRIX AMONG NATIONS

	1	2	3	4	5	6
1. United States	0.00					
2. South Africa	3.83	0.00				
3. Mexico	22.43	21.31	0.00			
4. Micronesia	3.14	2.18	20.82	0.00		
5. Australia	8.74	9.93	17.84	9.81	0.00	
6. Israel	37.87	39.38	30.69	38.73	33.52	0.00

TABLE 2. SPATIAL COORDINATE MATRIX AMONG NATIONS

	Dimensions					
	1	2	3	4	5	6
1. United States	9.03	4.44	0.54	0.69	0.02	0.48
2. South Africa	10.40	1.73	1.72	1.37	0.02	0.02
3. Mexico	4.24	13.63	0.48	0.11	0.02	0.09
4. Micronesia	9.75	1.70	2.18	0.71	0.02	0.45
5. Australia	3.88	1.04	5.63	0.08	0.02	0.12
6. Israel	28.83	4.73	0.70	0.07	0.02	0.02
Eigenvalues	1148.91	234.91	40.38	2.88	0.00	0.46
Percentage accounted for by individual vector	80.51	16.46	2.83	0.20	0.00	0.03

Mexico, which lies moderately between the cluster of English-speaking nations and Israel. This dimension explains over 80% of the residual variance. The second dimension may be labeled an economic development vector accounting for 16.5% of the residual variance. It runs from Mexico to the United States.

Most prominent in the cluster analysis is the tight grouping of the English-speaking countries (the United States, South Africa, Micronesia, and Australia). As can be seen in Table 1, the greatest average distance among the English language sample sites is 9.94. The smallest value from any sample member in this cluster and any other non-English sample member is 17.84. Figure 1 shows that this cluster is perfectly nested and clearly distinct. Around the English cluster is Mexico and, finally, the hierarchy is completed with the addition of Israel. These results confirm what had been described earlier with the multidimensional analysis of the residuals, where the first dimension revealed a grouping by language.

Discussion

The results seem to indicate that all sample members (nations) have a fairly consistent view of the mass media and its
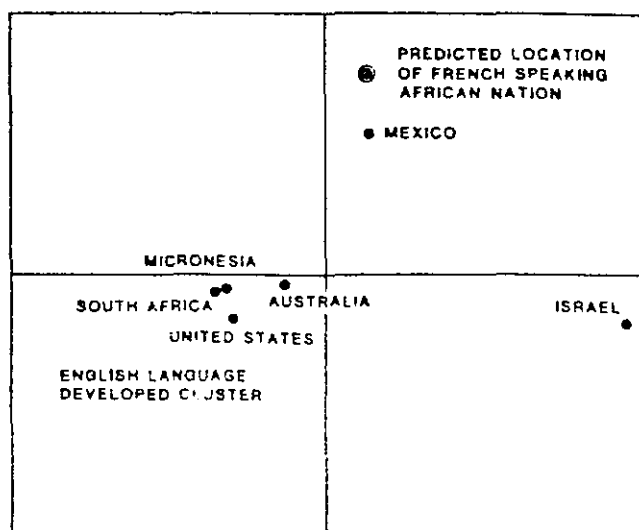

FIGURE 1. TWO DIMENSIONAL CONFIGURATION OF RESIDUAL VARIANCE OF SIX NATIONS

relation to other institutions and values in society. Israel has the most deviant view, but the degree of discrepancy from the other nations is only 30 to 40 galileos, or about 35% of the criterion pair. Mexico is the next most deviant. Its discrepancy is only 17 to 30 galileos, or about 23% of the criterion pair. The rest of the nations cluster quite consistently. While these differences may be attributable to a variety of factors, such as stability of social institutions, type of media, or political system, the authors attribute the differences between societies (cultures) to language and developmental factors.

Once the shared variance accounted for by the media system has been removed, the remaining variance seems to be accounted for by language (80.5%) and level of economic development (16.5%). Thus, the data suggest that language is a distinctive determinant of culture. This is consistent with Barnett (1977a, 1977b), who found that language per se is only of secondary importance in the organization of meaning across linguistic boundaries. In those studies, he controlled out the semantic components and found that language differences could explain a portion of the residual variance. In this study, the authors also controlled out the semantic component, that is, the shared perception of the mass media, and found language to be the most important factor in the cross-national comparison.

One might suggest that the reason the nations clustered by language is that the language in the media is generally the same. Most television and film content used by the English language sample members is produced in the United States, with some being produced in England. The print media produced in these nations can readily be used by each other, thus limiting the degree of cultural differences.

The results of this study provide evidence of the utility of metric multidimensional scaling for intercultural research in general and the development process in specific. Because of the high degree of consistency among the cultures and the ease of the post hoc theoretical explanation of the discrepancies among the sample members, the authors feel the results represent valid relationships. Had haphazard results appeared (a low degree of correspondence between the spaces) the validity would have been questionable.

Additional results that further demonstrate the utility of metric multidimensional scaling are the size of the Mexican and Israeli spaces. Had the authors chosen a measurement system that used a bounded scale, these spaces would have looked nearly identical to the other societies. Actually, the Mexican and Israeli subjects perceived greater dissimilarity (variance) among the concepts. This discrepancy seems to be accounted for by language and level of economic development.

There are some shortcomings of this study which should be pointed out. One deals with the internal and external validity. While it is implicit that each sample site is representative of the entire nation, this is in fact not the case. Each sample is composed only of students, a group clearly not representative of all the cultures under study. Part of the consistency of the results among sample sites may in fact be due to comparing students and perhaps the measurement of a universal student culture. Thus, any future research should be performed on samples representative of the nations under investigation. In that way, we can make generalizations based on the sample about the entire culture. Additionally, when the results from a given nation

are entered into further analysis, that is, cross-national comparisons, we will actually be comparing the cultures as claimed.

One additional threat to the internal validity of this study is the selection of the concepts scaled in the space. Only 15 cultural objects dealing with the mass media and their relation to a narrow range of institutions and values have been scaled. The measurement of other concepts is considered essential in order to more thoroughly understand the media's impact on political and economic development. Additional concepts have not been gathered here because $N(N - 1)/2$ comparisons are required for each N concept, so that the increase in pair comparisons is geometric while the increase in concepts is arithmetic. These factors of development have been examined elsewhere, but they were beyond the scope of this data collection. Barnett, Serota, and Taylor (1974, 1976) studied political development using the paradigm described in this paper, and Fink, Serota, Woelfel, and Noell (1977) have examined the media's relation to economic development.

Rather than simply examine these separate pictures of the process, it is possible to splice them together. This is possible once several concepts of extreme stability across the various cultures and time have been determined. These may then serve as fixed reference points upon which rotations may take place. In this way, it may become possible to accurately assess the effects of certain concepts gathered at one administration with another.

An additional shortcoming of this research concerns the sample of nations. Clearly, six nations is too few to draw the inferences that have been made in this article. Of the six sample nations, four use English. There is only one other Indo-European and one Semitic language in the sample. On the development dimension, most sample members are highly industrialized, with Mexico being the least developed nation in the group. All sample members have a capitalist economic system and a commercially based media system independent, at least to a certain extent, of their respective governments. Future research should be conducted in other societies to increase the variance in language, level of development, and other variables of theoretical concern. In that way, some confidence in the reported conclusions may be gained.

Hamid Mowlana (1976) has proposed a paradigm for comparative mass media analysis in which he identifies eight areas pertinent to the communication process. These factors include (1) types of ownership; (2) types of control; (3) sources of operation; (4) disposition of income and capital; (5) complexity of media bureaucracy; (6) perceived purpose; (7) messages; and (8) types of content. Any future research should attempt to compare attributes representative of these eight factors with the static structure resulting from cross-national comparisons. An important research question growing out of this discussion would be how do these factors change over time and how do these changes affect the spatial configuration? This suggests one final recommendation for future research, that is, over-time research on a large number of different cultures. In this way, one would be able to describe and track the development process, the diffusion of innovations among cultures, and the role of the mass media in these processes.

At this point it is possible to predict the location of future sample sites in the inter-nation space. Take for example, a nation in sub-Sahara Africa that was a former French colony and

where French is still widely spoken. It may be predicted that this nation would appear in the space in the first quadrant near Mexico on the first language dimension and somewhat higher (less developed) on the second dimension. This general region of the space is indicated by an X in Figure 1.

Summary

In summary, development has been conceptualized as a multidimensional construct including economic, political, educational, and media factors. We proposed the use of metric multidimensional scaling to measure the interactions among the mass media and other cultural components, such as the nation-state, instructions of society (economic, educational, religious), the individual self-conception, and the values of the members of society. When measured over time, it became possible to describe the development of society. An example was then provided using samples from six different nations (United States, South Africa, Mexico, Micronesia, Australia, and Israel). The results indicated a consistent pattern among the six nations in terms of their perceptions of the mass media. The residual variance may be explained by two factors: language and economic development. The residual accounted for 6% of the total variance, of which, language accounted for about 80% and economic development 16.5%.

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APPENDIX

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This list of references is drawn from a larger bibliography containing all the Galileo (tm) materials. Items were selected which would be of special interest to the readers of *Human Organization*. The complete bibliography was presented to the International Communication Association in Acapulco, Mexico, May, 1980. It may be obtained by writing George A. Barnett.

The Galileo (tm) computer program is available at over 20 universities in the United States. A copy of the program may be obtained for a small fee from Joseph Woelfel.

A basic user's guide to the Galileo System (tm) is entitled *How To Do A Galileo Study*. It is written by Joseph Woelfel, Richard Holmes, D. Lawrence Kincaid, and George A. Barnett and is published by Good Books, Troy, New York. It may be obtained from either George A. Barnett or Joseph Woelfel. The book is designed for the first-time Galileo user. It is meant to provide a working guide to the design and execution of a simple but complete Galileo study from initial conception of the problem to write-up of a final report of findings. It is intended primarily for the user who has a practical or applied problem to solve, rather than for the theoretical worker whose primary aim is the advancement of theory. It assumes no special technical or mathematical skill beyond elementary geometry and some high school algebra, and it does not require computer programming skill. Even so, it may prove useful to the expert theorist or methodologist who is unacquainted with the Galileo technique (p. vi).