The influence of centralization on innovation, mechanization and complexity in a group of mexican organizations

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Summary

The investigation modifies scales on innovation, centralization, complexity and the mechanization in the Mexican labor context. It analyzes the information through correlations, factor analysis and discriminating analysis pointing out validity and reliability of the instruments and the nature of the associations and their trascendency for the study of the Mexican organizations.

Introduction

In the scientific investigation field in administration and within the organizational context, variables exist which must be studied with maximum profundity in order to know their interaction and their possible effect in the administrative function of the corporations.

The general objective of this investigations is to have the most knowledge of the influence that centralization has in the managing levels of an organization in relation to innovation, mechanization and to the complexity in the Mexican labor media.

Innovation, complexity and mechanization, as variables, are studied through the factors which integrate the labor structure. Complexity is described as an internal factor in the structure of the organizations and mechanization is usually mentioned as an external factor.

In this investigation the concepts which have most acceptance are presented to define the variables which are being studied, as well as their most representative dimentions, plus a scaling system for their measurement.

The problem which studies this investigations can be defined as follows: The rhythm which at present is demanded from the organizations in order to keep them actualized so that their possessions and services possess an optimum quality, according to standards of advanced scientific and technologic development, makes it necessary to determine how

important it is for the enterprises or institutions the introduction of changes and the handling of innovation systems and to determine if the complexity of their organization is in accordance with the flexibility that this last one requires, besides taking notice of the impact that centralization and mechanization have inside and outside the corporation.

For this purpose we worked with the following hypothesis:

I.- Toward a greater tendency to innovation, lesser centralization exist in the organizations.

II.- At greater centralization in the organizations, there is less complexity.

III.- At greater tendency toward innovation, a greater complexity attends in the organizations.

IV.- At greater mechanization, greater complexity exists in the corporations.

V.- At a greater tendency toward innovation, there is greater mechanization in the organizations.

To approve or reject these Hypothesis the following method was utilized.

Modify the Martin Patchen innovation scales (1965, 3); M. Aiken and G. Hage centralization according to Price (1972, 43); J.H. Inkson, D. S. Pugh and D. J. Hickson's mechanization (1970, 318) and R. H. Hall, J. E. Haas and N. J. Johnson's complexity (1967, 903), in order to adapt them and make them more in accordance to the labor conditions of Mexico. These scales were validated and proved reliability at usedul levels, as shown in the results in tables 1 and 2.

The sample was integrated as follows: 53 corporations of the private sector distributed throughout the national territory, mainly in the folloswing cities: Guadalajara, Jal., Monterrey, N.L., Saltillo, Coah., Durando Dgo., Chihuahua, Ch., Tijuana, B. C., Nogales, Son., Cd. Juárez, Chih., Matamoros, Tamps. and Mexico, D.F. The enterprises which were selected were the most representative in the mentioned cities, both for the amount of their total assets, as for the systems of production of possessions or services. The interviews for the compilation of information were made on a personal disposition with high management of the enterprises or with their owners, plus the ocular verification of equipments and work systems.

The modified questionnaire with a total of 29 items and whose answers were given in a Likert tipe scale, was applied to the 53 enterprises mentioned in the sample.

The processing of the information compiled was handled by automatized system through the program called "SPSS: Statistical Package for the Social Science; Nie, Norma, et al., (1975)".

The statistical models were: Bivariant Correlation Analysis (Pearson correlation) and Multiple, Factor Analysis and Discriminating Analysis.

GENERAL CONCEPTS

In this investigation variables are handled independently connected with scientific concepts and theories or organizations, as are: humane conduct in work, internal and external factors integrators of the labor conditions and productivity, which involve conceptual overlapping and contamination with each other, for which reason we do not pretend to differenciate causology and only strong associations are handled to integrate variables independently useful which permit to recognize and interpret the phenomena being studied. The handling of the selected variables: Centralization, Innovation, Complexity and Mechanization, does not exhaust the indicators that determine them in integral form. The modifications to the scales were made to make them more comprehensible to the Mexican labor reality.

Only the necessary indicators were utilized and sufficiently representative to achieve a specific handling of the phenomena under study.

The concepts which were essential to obtain the dimentions of the scaling structure can be synthetized as indicated as follows.

1. Innovation.- Terms belonging to social sciences. Hage and Aiken (1966, 503) considered it as that aspiration of an organization of being the first one to produce a new product or a new service. From the sociological view point it means any modifcation in the social structure or in the culture of a system. For Forehand (1963, 206) innovation is more noticed through the conduct (innovated) of the executives through their decision taking, defines it as a conduct that includes development and original solution to administrative problems and their evaluation within ample criteria that give concordance to preexisting practices. Patchen (1965, 3) relates it with the motivation and morality and with the development of perceptual instruments that have full vality and reliability and which reflect: labor motivation, interest in innovation in work, complacency to express disagreement with supervisors or chiefs, the attitude to achieve changes which could be introduced in the labor situations and the identification with the organization's work. A complementary dimension would be: "finding new ways of doing things at work".

2. Complexity. Is considered as the grade of structural differentiation within a social system. In management we speak of an highly complex organization when it has many authority levels, a great number of ocupational roles and numerous sub-units from the divisional and departamental view point. With this focus it is possible to distinguish the complexity in it's vertical and horizontal dimensions, Blau and Heydebrand (1966, 179), Blau (1968, 453), and Hall, Hass and Johnson (1967, 903).

The term "complexity" for Hickson (1969, 378) means the importance of the abilities in a social system. For Price (1972, 70) the concept "abilities" in work and in management associates and identifies itself more with "routinization". Meyer (1968, 211), gives more importance to the distribution of individuals among different ocupational categories to integrate the division of work and complexity, it can also be achieved through the number of roles which exit in an organization. Pugh and Hickson (1968, 65) describe "the ecology" as a common term between the division of work and complexity. Hall, Hass and Johnson (1967, 903) have established some indicators to know the behavior of the complexity variable, as are the number of authority levels for the vertical determination. Indik (1965, 339) does establish a measurement to know the dimension of the work division.

3. Centralization. Aiken and Hage (1966, 497) conceive centralization as the degrees in which power concentrates in a social system. In an administrative focus it is spoken of centralization when in a corporation all the power is exerted by an individual (or a group whith a very reduced number of members): inversely, the minimum degree of centralization exists when the power is exerted by a great number of members in the organization. Hage and Aiken (1967, 503), also consider it as a form of "dispersion" in a social system.

Price (1972, 43), established that Aiken and Hage give dimensionality to centralization trough the power under the decision taking and Williams, Hoffman and Mann do it getting into the knowledge of "power in general". Dimensionality can also be obtained from centralization measuring objective data which contain offical registries and observations of investigators, Whisler (1964, 314). There are other valuable attributes in the study of centralization as can be the control stretch, the number of authority levels and the "discretional time", Aiken and Hage (1967, 77). Upon completion of this investigation centralization was given dimensions under the degree of participation in the decision taking, with a focus of global organization and another represented by the degree of control that the respondents exert in their immediate labor activity.

4. Mechanization. For A. Faunce (1968, 42), mechanization is the degree in which a social system utilizes innimated energy sources. The concept applied to the study of management and the organizations is easily understood observing the energy they consume: automatized factories for the production of possessions, compufers, engines for petroleum derivatives, etc. Conceptually mechanizations has to be differenciated from automatization, industriali-

zation and technology. Literature on this theme is polarized in an important manner in the inanimated sources of energy and the degree in which the execution roll is repetitive in a system. Mechanization can be defined as the degree of continuos automatization in the operation sequence, when an inanimated source of energy is utilized for such purpose. Mechanization should not be associated only with the use of tools and equipment, Jerome (1934, 41). The analysis of mechanization is directed basically to the line of operation of the productive system and does not take into account if the organization has a microwave system for it's comunication between different cities, or if ir has an automatized system of electronic computation for it's managing controls.

Inkson, Pugh and Hickson (1979, 318) consider mechanization with a methodologic character that goes beyond the production systems, so that you can contemplate "global mechanization of the organization". This was the criteria used in this investigation.

RESULTS

Table number 1 shows the factorial structures of the scales, similar to what was found by the authors that designed them. Table number 2. shows: the correlation coefficients for the reliability of the perception instruments which were utilized (scales) and their significance level; a (matrix) distribution with the correlation coefficients between the variables (Pearson Corr SPSS) and a scheme on the association between the variables under study, whose correlation coefficientes were found at a useful level of significance of 0.001 to 0.05.

Table number 3, has the information of the discriminating analysis for the total of the sample. To obtain this data the innovation function was created through the respective scale, the same as the mechanization function, those that were applied to five groups related with the variable centralization in the dimension of decision taking under the subdimension of participation index in the labor organization. Groups 1 and 2 represent the lowest values for the centralization variable and groups 4 and 5 the highest centralization. The canonic correlation had a value of .56 and Wilk's Lambda .67; the value of chi-square was 19.7 at significance level of .02 ofr the INNOVATION" function and the coefficients for the central groups were (1) .59) (2) .31; (4) (−) .70. The same table number three presents the prediction of the groups, where 49.1 per cent of the cases studied are correctly classified. The value of chi-square for them was: 16.36 at significance level of 0.001.

DISCUSSION

Upon revising the dimensionality of the variables it is understood why mechanization was utilized as representative of the technological evolution in the mexican context which is not industrially developed, which impedes using sophisticated scales which make much more difficult comparisons between concepts and societies. The association between innovation and centralization registers a negative coefficient in correlation (− .49 at significance level .001) as shown in picture number two, which proves that the interest in labor innovation and the attitude to introduce changes have their minimum expression when the controls that the authority exerts weigh more, which means that with a bigger centralization and control of the managing exercise there will be a smaller innovation in the labor ambient of the organization. This result is trascendent for industry and business in Mexico, where innovation is determinant of progress in industries in development and expansion and where an exagerated centralization holds back the innovating conduct of the organizations.

The relation between centralization and complexity, shows a negative correlation coefficient (− .25 at significance level 0.03 as shown in table number two, which means that the evolution and development of the organizations has it's minimum expression when the controls that the authority exerts weigh more in decision taking of the highest level; that is at greater centralization and control of the managing exercise, there will be less complexity in the organizations. The trascendency that this situation carries is more in the sense that exagerated

centralization does not make it possible that the organization find the necessary equilibrium point in their development and evolution, in accordance with ambient media, for it imposes a stop of "central" origin which impedes the key areas of the organization to develop their functions agreeble with the needs of other important variables, which achieve more harmony among the organization and the ambient media and among elements and resources which compose it and give sense to it's survival.

The interaction between variables of innovation and complexity shows in table number two a positive association (.29 at significance level 0.01) which indicates that according to the innovative conduct of managers increases, so does the complexity of the organizations increases.

The mechanization variable did not show useful associations at a good level of significance in this investigation when it was correlated with the other three variables, maybe due to the fact that mechanization in the organizations studied is not sufficiently developed and integrated as other organizational variables are. This is deplorable because the application of advanced systems of technology are required with extreme urgency in different areas of production.

The revision of the results obtained through the discriminating analysis, presented in table number three, showsthat the innovation function (discriminating statistical function) had a useful significative level of 0.02 Wilks Lambda of .67 and canonic correlation of .56 and was able to differentiate groups 1 and 2 which represent the low levels of centralization of group 4, with high levels of centralization in it's rating and that these last ones had a negative distribution in the territorial maping, which confirms once more the negative association between the innovation variable and centralization, which was commented at the beggining of the discussion.

The five hypothesis which were worked with in this investigation, after, the results of the empiric test were analyzed, would finally remain in their contrast as: I, II, and III are accepted. IV and V are rejected.

Conclusions

1. This investigation proves that the modified scales for the variables: innovation, centralization and complexity have a highly satisfactory degree of valicity and reliability.

2. Three of the five proposed hypothesis in the investigation were accepted.

3. It is finally conceptualized that at a greater centralization of the organizations the innovating conduct of the executives is less and the organizations have less complexity in their structure and on the contrary at a greater innovating conduct of the executives there is a greater complexity in the organizations.

4. Through the discriminating analysis it was confirmed that the conduct o the executives for the innovation function had a negative distribution on the group with greater centralization in their organizations.

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TABLE No. 1

RESULST OF THE ANALYSIS OF FACTORS N = 53

INNOVATION, MEX.

ITEMS	FACTOR I	FACTOR II	COMUNALITY	MEDIA	S.D.
FACTOR I					
3	.51	.35	.38	3.7	1.2
4	.70	.03	.49	3.5	1.3
5	.71	.08	.51	4.6	1.6
FACTOR II					
1	.14	.53	.30	3.5	1.7
2	.07	.62	.39	3.0	1.5

FACTOR	EIGENVALOR	PCT FOR ITEM	PCT	A C U M U L A T E D
I	2.00	69.0		69.0
II	.61	21.2		90.2

CENTRALIZATION, MEX

ITEMS	FACTOR I	FACTOR II	COMMUNALITY	MEDIA	S.D.
FACTOR I					
4	.57	.27	.39	2.7	1.5
5	.51	.07	.27	2.3	1.3
6	.82	.04	.67	2.4	1.3
7	.62	.12	.39	2.2	1.1
8	.87	.16	.79	2.6	1.3
FACTOR II					
1	.23	.40	.21	3.1	1.4
2	.08	.72	.53	2.9	1.0
3	.13	.92	.87	2.7	1.0

FACTOR	EIGENVALUE	PCT PER ITEM	ACUMMULATED	PCT
I	4.59	68.1	68.1	
II	1.43	21.2	89.3	

COMPLEXITY, MEX

ITEMS	FACTOR I	FACTOR II	COMMUNALITY	MEDIA	S.D.
FACTOR I					
2	.66	.26	.51	1.8	.9
3	.70	.37	.63	2.0	.9
4	.72	.16	.55	1.9	.9
5	.65	.33	.53	1.9	.9
6	.54	.15	.31	2.0	.9
FACTOR II					
1	.47	.62	.60	1.9	.7
7	.39	.70	.64	1.8	.8
8	.14	.76	.60	2.4	1.5
9	.33	.72	.63	1.7	.8

FACTOR	EIGENVALUE	PCT PER ITEM	ACUMMULATED	PCT
I	5.58	72.4	72.4	
II	1.03	13.3	85.7	

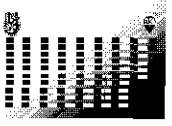

TABLA No. 2

CORRELATION COEFFICIENTS FOR RELIABILITY OF THE SCALES N = 53

	CORRELATION COEFFICIENT	SIGNIFICANCE LEVEL
INNOVATION, MEX	= 0.90	S = 0.001
CENTRALIZATION, MEX	= 0.97	S = 0.001
COMPLEXITY, MEX	= 0.99	S = 0.001

CORRELATION COEFFICIENTS BETWEEN VARIABLES

INNOVATION CENTRALIZATION MECHANIZATION COMPLEXITY

INNOVATION	1.000			
	S = .001			
	(−) .49	1.000		
CENTRALIZATION				
	S = .001	S = .001		
	(−) .03	(−) .11	1.000	
MECHANIZATION				
	S = .423	S = .210	2 = .001	
	.29	(−) .25	.19	1.000
	S = .015	2 = .036	S = .077	S − .001

SCHEME OF THE ASSOCIATION BETWEEN THE VARIABLES AND THE CORRELATION COEFICIENTS.

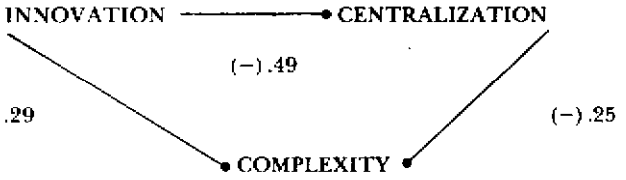

TABLE No. 3

DISCRIMINAT ANALYSIS

FUNCTION	EIGENVALUE	CANONICAL CORRELATION	WILKS LAMBDA	CHI-SQUARE	SIGNIFICANCE
INNOVATION	.47	.56	.67	19.70	.02

CENTROIDS GROPUS COEFFICIENTS (INNOVATION)

GROUP 1.	.59
GROUP 2.	.31
GROUP 4. (−)	.70

Prediction Results = 49.1 Percent of known cases correctly classifield

Chi − SQUARE = 16.35 Significance = .001

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