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Four issues per year. Annual subscription rate for institutions, \$70.00; for individuals associated with subscribing institutions, certifying that subscription is for personal use, \$20.00.

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International Arts & Sciences Press Inc.
901 North Broadway
White Plains, New York 10603

International Studies of Management & Organization

WINTER 1976-77/VOL. VI, NO. 4

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INTRODUCTION

In a rapidly changing environment, it is not enough for a firm only to focus on efficiency by making things better: it must also devote time and effort to making them different. An innovative approach is therefore required; and the creation of new products and processes, and new patterns of human interaction, will require an increasing share of management's time and attention in more and more enterprises.

Unfortunately, there is no standard solution that can be used for handling the innovation problem. New ways must be sought; and both creative thinking and practical experiments with new approaches will be needed in order to make progress. However, one does not have to base the innovation effort solely on intuition, flair, and personal experience. Support can now be gained from the emerging innovation science.

This is a new and still immature discipline. The theoretical foundation, based partly on empirical studies of innovation behavior and partly on other sciences, is fragmented and incomplete. Nonetheless, there is so much organized knowledge available in terms of concepts, principles, and methods that one does not have to rely only on routine and improvisation for mastering the change processes. This issue gives an overview of the central themes within innovation science.

The first paper, by Rigny, focuses on the human side of innovation. The firm is seen as part of a larger societal system. This requires an innovative approach in order to bring the firm's behavior into accord with the prevailing values of the society. Further, the firm is in itself a social system, in which people spend a large part of their lives. The problem here is

Notes

- 1) Special Studies Group, Industrial Liaison Department, TNO (1974) Innovatieprocessen in de Nederlandse Industrie (Apeldoorn, the Netherlands: TNO), p. 190. A detailed account of participants, background, objectives, methodology, results, conclusions, and recommendations of the study is found in this report.
- 2) Special Studies Group, Industrial Liaison Department, TNO (1974) Innovation Processes in Dutch Industry (Apeldoorn, the Netherlands: TNO), p. 45. This is an abbreviated version in English of the main report, note 1.
- 3) E. Jantsch (1967) Technological Forecasting in Perspectives (Paris: OECD), p. 401.

INDIVIDUAL AND STRUCTURAL FACTORS
IN TECHNOLOGICAL INNOVATION: THE CASE
OF THE ARGENTINE MANUFACTURING SECTOR

Ruth Sautu and Catalina Wainerman (Argentina)

The study summarized here was guided essentially by two goals: (1) to learn about the orientations of a group of entrepreneurs toward technological change and the incorporation of innovations; and (2) to find out whether there are significant differences in the orientations of entrepreneurs with different individual characteristics (sociological and sociopsychological) who lead firms in industries with different structural characteristics (size, level of modernity, historical origin of industry, and type of technology used).

The research was conducted among 103 entrepreneurs in 5 industries of the Argentine manufacturing sector: spinning of

A slightly modified version of Chapter XVII, "Resultados Generales," in Ruth Sautu and Catalina Wainerman (1971) El empresario y la innovación. Un estudio de las disposiciones de un grupo de dirigentes de empresas argentinas hacia el cambio tecnológico (Buenos Aires: Editorial del Instituto). Reprinted with permission of the Instituto Torcuato Di Tella, Buenos Aires, Argentina.

The authors are affiliated with the Centro de Estudios de Población associated with the Departamento de Ciencias Sociales, Fundación Bariloche, Buenos Aires.

cotton (cotton); radio and TV sets, record players and tape recorders (electronics); rolling of iron and steel (iron); molding, extruding, and fabricating of plastic articles (plastics); and spinning of wool (wool). All of them head firms with capital totally or predominantly of national origin, though they themselves may be foreign born. The data were derived from a survey carried out during the summer of 1970.

We have not attempted to obtain results that could be extrapolated to the entire Argentina entrepreneurship. In designing the sample for our study, we decided against samples that would be "representative" of all the entrepreneurial world of manufacturing industry in Argentina. For one reason, we could not afford it; but more importantly, it would not suit our purpose, since our major aim was to compare various subgroups within a particular section of the entrepreneurial population — that section formed by the entrepreneurs who belonged to the main manufacturing activities in the country because of their share in the total product and labor force of the manufacturing industry. These activities should also be ones in which locally owned firms constituted a majority. Moreover, within each activity, the incorporation of technological innovations should not be a function of the size of the firm, but there should exist technologies available for different sizes of firms.

The entrepreneurs included in the research sample are considered "typical" or "representative" specimens of the particular section of the Argentine entrepreneurial world just described. Their selection for the sample was made in three stages. The first was the selection of five manufacturing activities on the basis of (1) the historical incorporation of the activity into the industrial sector — before or after World War II; and (2) the technological basis of the activity — from a scientific or artisan viewpoint. The second stage was the selection of approximately 20 contrasting forms within each activity, using as criteria: (1) size — large or medium-sized firms; and (2) technological modernity — firms with modern or obsolete plants. The third stage was the selection of the chief decision-maker within each firm.

The following sections present the results of the inquiry into two areas central to this study: (1) the disposition to change that the interviewees show in their role of entrepreneurs, and (2) their orientations toward problems related to technological change and the incorporation of innovations in their own firms, industries, and in the industrial sector as a whole. The results in both areas will be presented in the same order: first, an analysis of the overall orientations; second, analysis of the orientations of the entrepreneurs who represented different activities.

Orientations of the Whole Interviewed Group

In this first part, we treat the group of 103 interviewed entrepreneurs as if there were no differences among them in terms of their individual characteristics or of those of the firms they direct, or the industries in which they operate. This will provide a general overview on which the results of the last part will be based, results some of which corroborate and others refine, and even qualify, those presented in this first part.

Disposition to Change on the Part of the Entrepreneurs

The first step was to look into the problem in a very general way, investigating the disposition to change that — in their role of entrepreneurs — the group interviewed revealed. We did this because even though a disposition toward the incorporation of innovations is an indicator of a positive or negative disposition with respect to technological change, it is not the only one. Attitudes toward other aspects of the entrepreneurial role also reveal such a trait. Thus, being unable to observe actual behavior, we analyzed the entrepreneurs' answers to a set of tests that presented situations of the kind an entrepreneur faces when leading his firm and that allow him to reveal his level of disposition toward change.

All the tests shared the following structure: when faced with

a problem, disjunction, or proposal, the entrepreneur had to decide between two alternatives, one of which implied a higher change level. In four of the tests the decision meant a low risk-taking level; in the other five, risk-taking played an important role.

In the case of low-risk-taking decisions, the absolute majority of those interviewed favored the alternative that implied a higher change level — that is, they would allow experts from outside to test their own new developments within the firm, they would accept an agreement based on results obtainable through the application of industrial-psychology techniques, and they would choose an imaginative person rather than a follower of routines to fill a vacancy in their production department.

As might be anticipated, when the risk-taking level was high, there was greater resistance to change. In terms of the risk-taking level that the entrepreneurs were ready to tolerate in the five situations presented, the majority chose to run moderate risks — neither too daring nor too conservative. This is an important finding, and it deserves particular attention, since it reveals a high level of rationality in decision-making situations that present two alternatives, one of which is much more enticing — in terms of the potential benefits it might produce — but much more risky as well.

It is also interesting to point out that, of the five situations presented, most entrepreneurs considered most risky the one that implied the possibility of a workmen's strike. The majority felt that this was much more risky and frightening than specializing the firm's production or launching a new product with no precedents in the market, risking from 25 to 30% of the profits already secured.

Since the tendency to tolerate risks also implies a tendency to tolerate changes, and on the assumption that knowledge of the reactions to a set of related stimuli affords a more valid and reliable knowledge of a person's more permanent disposition than that arising from reactions to isolated stimuli, we used the responses to the nine situational tests to elaborate a Guttman-type scale of "disposition to change." This scale

allowed us to evaluate the level of openness to change of the interviewees in their entrepreneurial role, that is, their disposition to take chances, to test and incorporate new techniques, solutions, and behaviors. By applying the "disposition to change" scale and analyzing the intensity component it includes, we were able to obtain an overall estimate of the level of disposition to change prevailing in the interviewed group.

The average score of the whole group is relatively favorable; but our measurement allowed us to detect three subgroups: one, the smallest, revealed an absolutely favorable disposition; a larger one, a definitely unfavorable disposition; and a third subgroup — about one-third — showed an intermediate level of disposition to change.

Orientation Toward the Introduction of Technological Innovations in the Firm

At the level of their own firms, we studied the motivations that led the entrepreneurs to incorporate innovations and their desires and actual possibilities of doing so. The study was focused on one point in time: the moment at which the study was being conducted. The conclusions arrived at, however, seem to reflect not only the particular conjunctural situation but more permanent orientations as well.

An absolute majority of the entrepreneurs were willing to incorporate innovations in their firms; and, surprisingly enough, only one-third said they lacked the means — economic as well as technological — to do so.

The factors that in the entrepreneurs' opinion favored or hindered their possibilities of innovating in their firms were mainly economic or, to a lesser degree, strictly technological. They were the same factors that made the entrepreneurs incorporate technological innovations, obtain economic benefits for their firms, and meet their technological needs.

The emphasis on the pursuit of economic goals revealed by most of the entrepreneurs is not an obvious fact. It has been said, and still is being said, that Latin American entrepreneurs

are motivated by extra-economic goals — such as the achievement of prestige, of social status, etc. — which make them essentially different from their colleagues in countries with a higher level of industrial development. Our results on this particular group of entrepreneurs seem to indicate that this is not the situation.

Orientation Toward Technological Change in Each Industry

So far we have discussed the entrepreneurs' orientations at the level of their own firms. When studying their orientations at the level of their industries, we found that an absolute majority thought that the local technological level was below the world level in their particular industries. But, even though the existence of a gap was perceived by an absolute majority, nearly half of the entrepreneurs did not regard it as too wide; and the level of confidence in the country's possibilities to bridge the gap was widespread among the entrepreneurs who were aware of its existence.

This high level of confidence does not seem to be based on candid optimism. Most of the interviewees offered very concrete solutions for facing the problem — both conjunctural and structural solutions.

The first type of solution is centered around possible ways of increasing production and finding markets for the products: loosening customs regulations, encouraging the importation of new technologies, increasing the supply of capital and loans, expanding the market, etc. The second type of solutions emphasizes the need for securing a greater political and economic stability, implementing economic and social policies, supporting research and scientific and technical training, etc.

There seems to be some relationship among the type of measures favored to bridge the technological gap, the perception of its width, and the level of confidence in bridging it. The entrepreneurs who think that the gap is widest are the most pessimistic concerning the possibilities of bridging it and

most frequently favor structural solutions.

Orientations Toward Technological Change in the Industrial Sector

At the higher level of the whole industrial sector, we were interested in finding out what type of technological-change process the entrepreneurs would be ready to favor. More specifically, we were interested in knowing to what extent they would be ready to support a process of technological development based mainly on the local creation of technology. To that effect we studied the entrepreneurs' attitudes toward local centers of scientific and technological research and their readiness to play an active role in the latter's development.

An absolute majority favored such centers; a majority — though a smaller one — also would accept an obligatory contribution to help support them. Most of the entrepreneurs had some information on the existence and functioning of at least one such center, about which we specifically inquired — the Instituto Nacional de Tecnología Industrial (INTI) (National Institute of Industrial Technology). Although few of them were members of it, most said they were ready to join. Perhaps one of the most interesting findings is that the percentage of entrepreneurs ready to become members was significantly higher among those who were informed of the institute's existence and mode of operation than among those who were not. This finding certainly has fundamental implications for the promotion of a process of technological development.

The knowledge that an entrepreneur regards scientific and technological research important, that he is ready to make economic contributions for its support, that he is informed about centers engaged in this kind of activity, and that he is willing to take an active part in them — as expressed by most of those interviewed — gives us no theoretical basis for inferring what value orientation he will have regarding some specific type of process of technological development for the industrial sector. In effect, it is logically and empirically

possible that entrepreneurs equally favorable toward research should encourage either a predominantly local process of industrial change or one based mainly on the incorporation of foreign technologies. In our study we consider it particularly relevant to know what degree of support these kinds of orientation receive.

In order to do so, we developed a scale that allowed us to evaluate the "adherence to the local creation of technology," defined as every explicit manifestation — more or less elaborated, more or less intense — of concern for a development process of predominantly local origin.

When the scale was applied, one-third of the entrepreneurs interviewed were found to rate high in adherence to a process of industrial modernization of predominantly local origin; a relative majority (somewhat over one-third) was found to be fairly favorable; and about one-fourth revealed little or no support for a process of this kind.

Disposition to Change and Orientation Toward the Local Creation of Technology

It is logically and empirically possible to conceive of the co-existence, within a single entrepreneur, of a high level of openness to change when leading his firm with a value orientation favoring a process of change based on local technology, or the opposite, that is, with a value orientation favoring a process based predominantly on the incorporation of foreign technologies.

In this study we attempted to give an empirical answer to this question. To that effect, we inquired if the entrepreneurs our "disposition to change" scale identified as the most positive — that is, the most willing to consider, test, and incorporate new techniques and solutions in their firms — were simultaneously identified as the most positive in the "adherence to the local creation of technology" scale.

Analysis of all the entrepreneurs showed the existence of a

positive association between both variables. In effect, the average level of adherence to a predominantly local process of industrial technological development of the entrepreneurs more ready to change is higher than that of those who are fairly ready to change and markedly higher than that of those who are more reluctant to introduce changes. This finding, as mentioned above, is the result of an overall analysis of the sample. As will be seen below, it is a finding that does not hold when additional factors are taken into account.

Differences in Orientations of the Interviewed Group

There are also differences among entrepreneurs with different individual characteristics, leading different types of firms, belonging to different industries.

Disposition to Change of Entrepreneurs from Different Industries and with Different Individual Characteristics

The disposition to change varies markedly among industries, as can be observed in Table 1. The average level of a favorable disposition to change among the entrepreneurs in electronics and plastics is the highest of all the industries; the lowest is that of the entrepreneurs in cotton and wool; and their colleagues in iron occupy an intermediate position. These results suggest the possible operation of a selective recruiting process of a "vocational" type. We do not discard the possibility of a process of professional socialization, but our data do not allow us to test it.

Since we found differences not only among industries but also within them, we analyzed some individual characteristics that might be associated with such differences. As was to be expected, the youngest entrepreneurs were found to rate higher in openness to change (a first, though insufficient, refutation of the professional socialization hypothesis). A difference in the same direction arises in a comparison of Argentine-born with

Table 1
Percent Distribution of Entrepreneurs in Each Industry
by Their Score on the Scale of "Disposition to Change"

Industry	Score on the scale of "disposition to change"					
	Low	1	2	3	4	High
Wool (n = 24)	4.0	8.5	12.5	29.0	46.0	—
Cotton (n = 19)	—	—	32.0	37.0	26.0	5.0
Iron (n = 16)	—	6.0	19.0	38.0	31.0	6.0
Plastics (n = 24)	—	4.0	12.5	17.0	62.5	4.0
Electronics (n = 20)	5.0	—	15.0	20.0	45.0	10.0
Total (n = 103)	2.0	4.0	17.0	27.0	44.0	5.0

foreign-born entrepreneurs. The native and the quasi-Argentine — that is, those who immigrated at an early age — entrepreneurs are more favorable to change than their foreign colleagues who immigrated when adults. This is a particularly interesting finding since it contradicts the statements of some theoreticians of underdevelopment who assign a higher degree of dynamism and entrepreneurial spirit to the foreign entrepreneurial elites in Latin American countries.

Probably the most interesting finding in this area is that the entrepreneurs with higher upward intergenerational mobility are the ones with greater disposition to change. The fact that the entrepreneurs more open to incorporation of changes are those who, besides being more upwardly mobile, have a lower level of formal education, and that those less open to change are those less upwardly mobile, but with a higher educational level, seemed to point out that the level of disposition to change that the entrepreneurs revealed was strongly associated with an antecedent psychological variable: the motivation for achievement and success. If this were so, this finding would be particularly relevant not only from a theoretical but from a practical point of view as well. It certainly deserves special attention, and should be looked into in future studies.

Orientation Toward the Introduction of
Technological Innovations in Firms Led by
Entrepreneurs in Different Industries

The desire to incorporate innovations in their firms expressed by the majority of the entrepreneurs at the time of the interview did not differ noticeably among the different industries. Instead, the one-third who, while desiring to incorporate innovations, said they were not able to do so at the moment is differentially distributed among the various industries. The impossibility of fulfilling the desire to innovate is highest among the entrepreneurs in iron and cotton — industries in which half of those who wish to innovate cannot do so — and lowest in electronics — in which only a very low percentage said they were in that condition.

The two kinds of needs that the entrepreneurs most frequently seek to fulfill through the incorporation of technological innovations in their firms are, first, economic ones and, second, technological ones. Factors of the same nature are perceived by the entrepreneurs as affecting their specific possibilities of introducing innovations; but, though the availability or lack of funds is in general much more important than the availability or lack of technological resources and trained manpower, it is differentially so for the entrepreneurs in the various industries. In electronics, the economic factors were mentioned much less frequently than in the other industries. The technological factors are relatively more important in plastics and, certainly, in electronics, but of very little importance in cotton.

Of the set of economic factors to which all the entrepreneurs assigned a great influence on their possibilities of innovating — or refraining from doing so — we made a detailed analysis of three: the factors related to financial problems, to market problems, and to importations. Although the three factors are mentioned in all the industries, they are more frequent in cotton and plastics than in electronics.

Orientation Toward Technological Change
in Their Own Industry Among Entrepreneurs
Differing in Individual Characteristics,
the Types of Firms They Lead, and the
Industries to Which They Belong

The feeling that the local technological level of their respective industries is below the one reached by the most highly industrialized countries is widespread; but the degree of awareness of the existence of a technological gap and the evaluation of its width varies among the members of the different industries included in this study. As a group, the entrepreneurs in iron and wool are the most positive ones; the ones in electronics and cotton, the most negative; and those in plastics take an intermediate position.

Within each industry the analysis of the answers from entrepreneurs in different types of firms and with different individual characteristics showed differences in their evaluation. In each industry the entrepreneurs in large firms regard as more positive the local level of their industries (but the difference in evaluation among entrepreneurs in firms of different sizes is influenced by the evaluation prevailing in the whole of their industry; those differences are smaller in the industries whose entrepreneurs are, as a group, more positive). The situation varies if the level of modernity of the plants in each industry is taken into account. In three industries — electronics, wool, and iron — the entrepreneurs in the more modern firms are the more positive ones; in plastics and cotton, on the other hand, the more positive entrepreneurs are those in the less modern firms.

The older entrepreneurs in all the industries — except in iron — are the most positive; the same holds for those of lower educational level — except in plastics.

The fact that, along with the industry, a particular characteristic of the firms — their size — should have proved to be the variable most consistently associated with the entrepreneurs' differential evaluations made us assume that this pattern was

very probably explained in terms of the definition of "industry" used by the entrepreneurs interviewed. In effect, it is possible that some might have thought of the industry, at the local level, not as the set of all the firms, but only as the subset of firms of the same size as theirs. Since at the world level the highest technological standard in each industry is that of the subset of the largest ones, perhaps the perception of a narrower gap on the part of the entrepreneurs in the larger firms (and of a wider one on the part of those in medium-sized firms) could be accounted for by the different definition of industry, at the local level, given by the interviewed entrepreneurs. We do not discard the possibility of the existence of a differential distribution in the amount and quality of information about levels of technological development among entrepreneurs in firms of different size.

Even though, as mentioned above, most entrepreneurs perceive the existence of a technological gap in their respective industries, it is important to point out again that the level of confidence in the country's possibility of bridging it is shared even more. This optimism, however, depends on the type of solutions chosen to bridge the gap.

Electronics and iron are the industries in which the largest number of entrepreneurs choose solutions of the structural type. They are followed, in a decreasing order, by those in plastics and wool and, at a very great distance, those in cotton. It is interesting to note that the relationship between the perception of the gap as wider and the preference for structural solutions revealed in our overall analysis is found again in the analysis of each industry — with the exception of cotton.

In addition to the variation among industries, within each of them, entrepreneurs differ in their relative preference for one or another type of solutions.

In all the industries the support for structural solutions is more frequent among the leaders of firms whose plants are technologically more modern. Also in all the industries — with the exception of wool — the preference for this type of solution is more widespread among entrepreneurs in large firms. The

intra-industry differences in the orientations of entrepreneurs in more or less modern firms and of entrepreneurs in larger or smaller firms vary depending on the industry; but it is interesting to point out that, if the industries are ranked in decreasing order in terms of the differences arising from a comparison between large and medium-sized firms within each industry and between the more and less modern ones — also within each industry — the same ranking is obtained in each case. That is, in electronics, plastics, and iron the differences between the preference for structural solutions of the entrepreneurs in large and medium-sized firms, on the one hand, and of the entrepreneurs in more or less modern plants, on the other, are larger than the differences among similar groups of entrepreneurs in cotton and wool.

The two individual characteristics of the entrepreneurs that we investigated — age and level of formal education — have different relationships to the choice of different types of solutions in each industry. In three of them — cotton, wool, and plastics — the younger entrepreneurs are more frequently oriented to structural solutions; in iron and electronics, on the other hand, this type of orientation is more frequent in the older ones. Also in three industries — iron, electronics, and plastics — the entrepreneurs who attended college are the ones who more frequently choose structural solutions; in wool the situation is the opposite, and in cotton there are practically no differences between the orientations of those who did or did not attend college.

The patterns found when investigating the differences in the orientations of entrepreneurs in different types of firms — in terms of their size and the degree of modernity of their plants — make us assume that the factors associated with the firms' characteristics play an essential role in the entrepreneurs' orientations concerning solutions for bridging the technological gap. It is likely that when the entrepreneurs suggested solutions for bridging the technological gap in their respective industries they should have taken into account, in the first place, the technological needs of their own firms — that is, they prob-

ably defined the industry not as the set of all the firms, but as the subset of firms with characteristics similar to those of their own firms.

Orientation Toward Technological Change
in the Industrial Sector Among Entrepreneurs
Differing in Individual Characteristics,
the Types of Firms They Lead, and the
Industries to Which They Belong

The overall analysis of the entrepreneurs' attitudes toward the work of research centers is in most cases positive. There are very few differences in the attitudes of entrepreneurs in different industries in this respect. Also, a majority of about two-thirds would make economic contributions for support of research centers if the national government determined that they should do so. With regard to the contributions, there certainly are differences among the entrepreneurs in the different industries. The percentage of those reluctant to make contributions is higher in electronics, plastics, and wool than in iron and cotton. Since the reason given by the majority of these entrepreneurs was their rejection of the national government as an agent able to handle the contributions, it is not possible to determine whether they were actually rejecting the government's intervention or their contribution to research centers.

As mentioned above, most of the entrepreneurs claimed to be acquainted with the existence and functioning of a research center — the National Institute of Industrial Technology (INTI). In this instance there are practically no differences in the amount of information revealed by the entrepreneurs in the different industries. Though the majority would be ready to join an institution with the characteristics of the INTI, the highest percentage of those who would not is found in electronics. A fact that once more deserves mention is that, as in the overall analysis, the positive relationship between the amount of information and the readiness to participate in institutions concerned with technological development holds for each industry; this

provides further favorable evidence to the above-mentioned association between amount of information and readiness to participate.

When specifically analyzing the entrepreneurs' value orientations toward the type of process of technological change they considered desirable for the whole industrial sector — that is, their level of adherence to the local creation of technology — we found that the entrepreneurs in electronics and those in wool took positions at each pole in the adherence scale we developed. Table 2 summarizes these results.

In effect, in electronics, the majority is shown to be high in adherence to a process of this type; on the other hand, in wool most entrepreneurs prefer a process based on the incorporation of foreign technologies. The entrepreneurs in the other three industries rank — from the more positive to the more negative pole — as follows: iron, cotton, and plastics.

When carrying out the differential analysis of the value orientations toward a predominantly local process of technological change, we did not attempt to explain why the entrepreneurs did or did not favor the local creation of technology, but rather to find out what characteristics differentiated those who did from those who did not. To that effect, we started by looking at the orientations of entrepreneurs in firms with different characteristics.

The support for a predominantly local process of technological development is, in all the industries except wool, greater among the entrepreneurs in the large firms than among those in the medium-sized ones. The range of the intra-industry differences ranks, in decreasing order, the four industries for which the relationship holds as follows: electronics, plastics, cotton, and iron. Moreover, in three of the five industries — electronics, plastics, and iron — the greater support for a local process of development comes from entrepreneurs in firms whose plants are technologically more modern. In the other two — wool and cotton — on the other hand, the relationship is the opposite.

When the entrepreneurs' sociological characteristics in re-

Table 2

Percent Distribution of Entrepreneurs in Each Industry by Their Score on the Scale of "Adherence to the Local Creation of Technology"

Industry	Score on the scale of "adherence to the local creation of technology"					
	Low	0	1	2	3	High
Wool (n = 24)	—	33.0	46.0	21.0	—	—
Cotton (n = 19)	11.0	5.0	58.0	21.0	5.0	—
Iron (n = 16)	12.5	12.5	44.0	25.0	6.0	—
Plastics (n = 24)	4.0	25.0	46.0	12.5	12.5	—
Electronics (n = 20)	10.0	5.0	20.0	30.0	35.0	—
Total (n = 103)	7.0	17.0	43.0	21.0	12.0	—

lation to their orientations on this problem were taken into account, the analysis revealed that in three of the five industries — electronics, wool, and plastics — the support for this kind of process of change is greater among the older entrepreneurs. In the other two industries — iron and cotton — the relationship is quite the opposite. Moreover, in the five industries the entrepreneurs' level of formal education is negatively associated with the amount of support for the local creation of technology. In all the industries the entrepreneurs with a relatively lower level of formal education tend to give more support to a predominantly local process of technological change.

A pattern evident in the analyses in which the characteristics of the entrepreneurs and of the firms were taken into account is that, in most cases, the greater percentage of high scores in the "adherence to the local creation of technology" scale are those of the entrepreneurs in electronics, and of the low scores, those of the entrepreneurs in wool.

Analysis of our data allows us to state that probably the entrepreneurs in the same industry, leading firms of similar size, make up a quasi-group whose members share some common in-

terests and, consequently, some common value orientations — that is, the degree of support for the local creation of technology as a means of achieving the technological change in the industrial sector would indicate common values of members of the same industry, leading the same type of firms.

Disposition to Change and Orientation Toward

a. Predominantly Local Process of Technological

Change Among Entrepreneurs in Different Industries, of Different Firm Size and Educational Level

The analysis of the five industries revealed that the entrepreneurs who were more disposed to change were also those who gave greater support to a predominantly local process of technological change. The separate analysis of each industry proved the existence of this positive association in all the industries except cotton. However, this association was modified when other characteristics were taken into account.

In all the industries, among the entrepreneurs in medium-sized firms, those who were more open to change gave greater support to the local creation of technology than their colleagues who were less so. This positive association, however, does not hold among the entrepreneurs in the large firms. In three industries — cotton, iron, and wool — the interviewees who proved to be less open to change gave comparatively more support to the local creation of technology; in the other two industries — electronics and plastics — the greater support also came from those who ranked high in openness to change.

When the entrepreneurs' level of formal education was taken into account, we found that in only one industry — plastics — independently of the educational level, those who were more open to change also gave greater support to the local creation of technology. In the other industries — with the exception of cotton — this positive association is found only among the entrepreneurs who did not attend college; and among those who did attend college, the association is negative, with the exception of the entrepreneurs in cotton and plastics, as mentioned above.

The fact that those most open to change who lead different types of firms and differ in educational level are not the ones who (systematically in all the industries) offer greater support to the local creation of technology made us wonder again if the educational level or the firms' size were not the characteristics more highly associated with a predominantly local process of technological change.

On the one hand, in no industry — when the disposition to change was taken into account — did the entrepreneurs with a similar level of formal education appear to share similar value orientations. On the other hand, when taking into account simultaneously the size of the firm led by the entrepreneur and his level of disposition to change, we found that in four industries the highest average scores of support for the local creation of technology came in electronics and plastics, from entrepreneurs leading large firms and with a high disposition to change; in cotton and iron also, from entrepreneurs in large firms but, in this case, with little disposition to change; and, finally, in wool, from the entrepreneurs in medium-sized firms with a high disposition to change. Analysis of the highest average scores on the adherence to the local creation of technology scale revealed the same interindustry differences as were observed when we analyzed the level of support given by entrepreneurs in firms of different size but did not take into account their disposition to change.

On the basis of these results we concluded that, most probably, entrepreneurs in the same industry and type of firm express similar values because they share some interests in the need to control, at the local level, the creation of technologies for a more effective development of their firms. However, individual variables — mainly the disposition to assume change behavior in their firms — probably affect some entrepreneurs' level of adherence to the values shared by most of the members of a [particular] industry and type of firm.