

May

F.S.

1058

THE STUDY OF
TECHNOLOGICAL CHANGE IN UNDERDEVELOPED AREAS

PRACTICUM SESSION II

Report of Team II

Richard Lamana, Chairman
Betty Jean Gowland
Father Gabriel Lee

11-167

Dr. Frank A. Santopolo
Methods of Social Research
March 7, 1958

TABLE OF CONTENTS

Part	Page
I. CRITIQUE OF TEAM I	1
II. STATEMENT OF THE PROBLEM & PERSPECTIVE	3
III. THE SOCIAL SYSTEM & SOCIAL CHANGE	4
IV. A SUGGESTED POINT OF DEPARTURE	6
V. A PARADIGM FOR THE STUDY OF TECHNOLOGICAL CHANGE	8
VI. OUTLINE FOR THE STUDY OF TECHNOLOGICAL CHANGE IN UNDERDEVELOPED COUNTRIES	10
VII. STUDY OF THE INDIVIDUAL ADJUSTMENT TO THE TECHNICAL CHANGE.....	12
Statement of the Problem	
Hypothesis	
Methods	
Chart	
VIII. TECHNOLOGICAL CATEGORIES	16

I. CRITIQUE OF TEAM I

The report submitted by Team I proved valuable as an exploratory step in the analysis of our problem, however, we feel it was deficient in several respects which we would briefly like to point out. Our first criticism is that it was not clear from the report just what point of view was being taken. Was the analysis from the point of view of the observer or from the that of the actor? From whose point of view did the changes have to be rational? Were any value judgements made as to the motivation of the agent of change and the value of the change itself?

A second weakness was the inadequate treatment of the role of the agent of change. The fact that in every society there is a differentiation of status, that is some will be leaders and some followers, as well as an unequal distribution of power, is an important consideration in any analysis of social change. The relationship of vested interests to the introduction of social change was also overlooked.

While it is true that technology is a part of the adaptive phase of action, it is questionable whether the increase of technology inevitably leads to a society where the primary phase is adaptation. It is conceivable to have different articulations of the five pattern variables and different orders of the four phases of action. The great value of Parsons' scheme is that it does not leave you with only a choice between Gemeinschaft and Gesellschaft which was overlooked by Team I.

We feel that Team I's definition of technological change ("..the adoption of a rational means to achieve a desired end which logically is more efficient than any other means which was available to the society since the time of its inception") is adequate, however, we have elaborated upon their list of constituents and this may be found on the page following our paradigm.

It was felt that their definition of underdeveloped areas suffered from an over-emphasis on demographic factors which we consider only one of many other significant elements. It must be remembered that the concept "underdeveloped" is relative and therefore meaningful only in a comparative sense. We have, however, listed some of the important recurring characteristics found often in underdeveloped areas. Yet the classification of a particular area will depend on the point of view of the classifier. The Secretary General of the United Nations points out:

It is impossible to define economic development precisely or in absolute terms. Development is a process, which is nowhere complete and nowhere entirely absent. It is never an isolated phenomenon. It is the product of simultaneous developments in many fields....Underdeveloped countries differ widely in their climate, resources, population, and history--both among themselves and in relation to the more advanced countries--and for each the first step in development must be a realistic appraisal of its special conditions and needs....Development in each country must grow out of that country's particular needs, desires and potentialities. It is impossible to transfer a given pattern of development intact from one area to another. A technical assistance programme will be judged largely by its practical success in adapting and combining scientific findings and technical experience from many sources to meet the requirements and resources of particular countries.¹

Some of the common characteristics of an underdeveloped area are as follows:

1. Low productivity per worker in agriculture and industry.
2. Low personal income.
3. Poorly utilized and developed natural resources.
4. Little or no capital accumulation for further investment.
5. Ineffective communication system.
6. Poor transportation system.
7. Lack of educational facilities -- Liberal and technical.
8. High degree of illiteracy.
9. Unskilled labor force.
10. Lack of competent administrative personnel.
11. Demographic characteristics -- high birth and death rates.
12. Poor health, welfare and medical services and facilities.
13. Malnutrition.
14. Absence of significant social and economic progress.

¹United Nations, Secretary General, Technical Assistance For Economic Development, (New York, United Nations, 1949) p. 4.

As you see, it would be impossible to set up an absolute criteria for classifying underdeveloped countries. However, the above characteristic could be used in a comparative world analysis, from which some criteria might be evolved. The UN and Point Four have defined rough criteria for their own use which might be helpful. The UN considers any country that produces less than \$100 ~~XXX~~ (500 International Points) per year per person in goods and services as underdeveloped.² Point Four uses two indices: 1) Those countries with an average rate of growth of per capita income less than 1 or 2 % over a 5 year period,³ and 2) Those countries whose average agricultural and industrial output per person is less than 1/10 of more advanced countries.⁴

II. STATEMENT OF THE PROBLEM & PERSPECTIVE

What guides to action can the professional sociologist provide for the official responsible for carrying out a policy of deliberate technological change in an underdeveloped area? We will assume the point of view of the innovator, that is the individual or group desirous of making a change or someone simply interested in studying change from a scholarly view point. We will prescind from making value judgements on the motives of the innovator or the value of the change itself. Our discussion should be of value to the Planned Parenthood League in Puerto Rico as well as the Soviet Technologists in the Middle East or simply the interested scholar.

We will begin our discussion by clarifying what we mean when we speak of social systems and social change. This will be followed by a suggested point of departure for the discussion of our problem. Our proposed

²Finer, Dr. Herman, The United Nations Economic and Social Council, No. 12, America Looks Ahead, (Boston: World Peace Foundation, 1945), pp. 14-15.

³Millikan, Max F., and W.W. Rostow, A Proposal, Key to an Effective Foreign Policy, (N.Y.: Harper & Brothers, 1957) pp. 48-49.

⁴UN Secretary General, loc. cit.

4
paradigm and explanatory notes for the structural-functional analysis of the process of technological change comes next. In the final section we attempt to answer the question of what happens to the individual members of the social system while its equilibrium is being reestablished after an innovation in the technical system.

III. THE SOCIAL SYSTEM & SOCIAL CHANGE

Society, from whatever perspective one chooses to view it, is a totality made up of interrelated and interdependent parts. In any case it is functioning as a whole, on-going system. The different components of society are constantly acting and reacting upon one another and in relation to one another, in various ways adopting themselves or being adapted to changes occurring in other segments of society. The individual, interacting actors develop a system of expectations which has a fundamental tendency to stabilize.

In order to deal with the facts of social and cultural change it is useful to conceive of society as a system whose equilibrium is constantly being disturbed, and, in some degree, reestablished. By equilibrium is meant a state of affairs in which institutions, values, and social structures are functionally interrelated and form a more or less integrated whole. Since no society is absolutely static, it is necessary to describe this equilibrium as dynamic or moving, and therefore as always partial. As changes occur and their repercussions are felt, adjustments are made which tend to restore the equilibrium of the society.

The analysis of change is therefore really the examination of the circumstances which tend to upset the relative equilibrium of a society. These disturbing elements may come from other cultures via diffusion, from institutionally sanctioned patterns of change and innovation, or (since no society is perfectly integrated) from tensions, strains, or conflicts generated within the system itself.

1. By diffusion is meant the transfer of culture elements from one society to another. The significant questions about ~~diffusion~~ diffusion concern the conditions under which new cultural patterns are accepted or rejected, the processes by which they become part of the host culture, and the consequences of their introduction for that culture and society.

2. In American society and most modern societies technological change has become institutionalized. Change is looked upon as a good in itself and has become synonymous with progress. Even in such varied areas of social life as leisure and business procedures there is a wide range of permissiveness and toleration for new practices, techniques, and ideas.

3. As social change occurs, tensions, and strains may be created within the society, leading in turn to further changes. The sources of change can frequently be found in inconsistencies among social norms, in difficulties in the relations among various groups, and in contradictions between traditional belief and concrete reality which lead individuals and groups to question the existing order and to propose alternative institutions and forms of social organization.

In the analysis of change we must include influences from other cultures which manage to become part of the host culture, institutionalized sources of change, which are approved and accepted, latent functions of existing institutions and social structures, tensions generated in those areas where society is not fully or effectively integrated, and organized attempts to effect changes. Although a total explanation of any change may necessitate consideration of all the variables, it is possible to assess their relative importance and abstract one for special consideration. While acknowledging that technological change can be the result of other changes and is in some degree dependent upon favorable conditions in the social system, we consider the more important aspect to be one of an organized group with a deliberate policy of technical change in search of

a practical program for implementing it. Hence, we will consider the controlled or independent variable to be technological change.

The elaboration of every system of expectations involves an element of evaluation and differentiation. Hence in every social system there is a ranking of both individuals and groups. This differential status is of the utmost importance in considering social change. The elites, or strategic decision-making and opinion forming strata, of a society must cooperate if the change is to be a peaceful and voluntary one. This point is related to the question of the distribution of power within the society. Every society has individuals and groups who have a vested interest in maintaining the status-quo. Hence, change is never just ~~xxxxxxxxxxxx~~ alteration of pattern but alteration by the overcoming of resistance, and the power possessed by the opposition cannot be ignored.

IV. A SUGGESTED POINT OF DEPARTURE

We are not prepared to lay down general rules for the introduction of technological change or to make generalizations about the actual conditions under which the innovation will be accepted. We are, however, suggesting a logical scheme for attacking our problem. Every one who with desires to introduce or study technological change in an underdeveloped area must find adequate answers to the following questions in order to succeed in reaching his objective. He must determine the type of changes that are necessary, the magnitude of the changes, the timing of the changes, and the means used. In effect, as was suggested by Team I, a structural-functional analysis of the social system is required. However, we believe the data from such a study will be more meaningful and useful for our purposes if it is organized around four central questions.

1. WHAT? Here one must decide what type of change is desirable in the light of what is possible. To determine the possibilities one must determine what factors now tend to upset the relative equilibrium of the

society. The nature and amount of diffusion; the degree of stability, formality, explicitness, durability and flexibility of institution; and the nature and amount of tensions, strains, or conflicts generated within the system will all help to determine the type of technical change that will be most readily accepted and/or least effectively opposed.

2. HOW MUCH? Here one must determine how much technical change can be introduced without over taxing the society's ability to reestablish its equilibrium. Should the idea or invention to be introduced be given in the most abstract form possible, so that it may be incorporated within the old pattern with a minimum of change, or should it be accompanied by an many congruent changes as possible, that is, as much of the culture in which the new idea is imbedded as possible? Careful consideration must be given to the latent functions of existing institutions and social structures and all possible consequences of the intended change. The example given by Team I of the textile mill in South Africa, illustrates the failure to successfully introduce an isolated change which was dependent upon other changes.

3. WHEN? The question to be answered here is, under what set of circumstances and at what point in time would the changes be least disrupting or best received? In other words the exigencies of the situation must be taken into account. For example, the Western World's refusal to provide Egypt with arms and technical assistance, and the British and French attack in 1956 created a situation made to order for those interested in introducing Soviet technology into the Egyptian social system.

4. HOW? Here we must explore the possible means that can be employed in introducing the change. What values, vested interests, leaders, and power groups in the society can be used to accomplish our ends? Which of them can we expect to be opposed to the change? How well established and powerful are they? In a traditionalistic, highly hierarchized and

integrated society like Japan's, the best way of introducing change after World War II probably was through the established symbols of authority (the emperor) and rule with an iron hand as was done by General McArthur. In a society where women are looked down upon and age is respected, you would not utilize a young girl as your agent of change.

You will notice that we have asked a lot of questions but have provided no answers. This is really as far as you can go without empirical research. Of course, we cannot undertake empirical research at this time, but we feel that there are a number of case studies available and that if future teams work within the framework developed here, they may be able to compile data as to how our questions were answered in different instances. In this way we may be able to make some empirical generalizations about the principles involved in introducing technological change in an underdeveloped area and we may eventually derive a theory of technological change.

V. A PARADIGM FOR THE STUDY OF TECHNOLOGICAL CHANGE

Below, a basic diagram and more extensive outline have been set up for both studying technological change in general or in relation to a particular community, society, or situation in relation to past, and future technical change. Therefore, it is an abstract and a practical paradigm. Both the scholar and the innovator can use it.

We have proposed a number of questions which would be necessary to complete and make meaningful the paradigm, thus clarifying the implicit relationships, especially in regard to part III. These are mainly found in part IV which we considered important elements that must be considered in regard to technological change. It should be noted that the extensiveness of the list is not complete, but only a suggestion.

FUNDAMENTAL PARADIGM FOR THE STUDY OF
TECHNOLOGICAL CHANGE IN UNDER*
DEVELOPED COUNTRIES

I. Existing Technological Situation

- a. Present status.
- b. Possible Developments.
- c. Necessary Developments.

II. Existing Social Equilibrium

- a. At present
- b. Historical perspective.

III. How Are They Related

- a. The existing states.
- b. The possible to the existing.
- c. Changes necessary to effect the possible.
- d. Probability of change in relation to the existing social situation.
- e. Projected relation of technical changes and possible future configuration of the society.

IV. What are the most crucial elements to be considered in relation to a society and technological change?

- a. Elites
- b. Norms
- c. Social Control
- d. Culture
- e. Diffusion
- f. Innovation
- g. Residuality - latent function
- h. Trust
- i. ?

VI. OUTLINE FOR THE STUDY OF TECHNOLOGICAL CHANGE IN UNDER-DEVELOPED COUNTRIES

I. Evaluation of existing technological situation

- a. Present status of:
 - poverty
 - productivity per workder
 - capital accumulation
 - income
 - communication
 - literacy
 - travel
 - education
 - nutrition
 - sanitation
 - adminsitration
 - agriculture
 - industry
 - national resources
 - subsistence level
- b. Potential develop-ments
 - resources
 - techniques
 - agriculture
 - skills
 - etc.
- c. Desired (Necessary) Developments
- d. Ecological situation

II. Evaluation of existing Social Equilibrium

- a. Distribution and juxtaposition of Parsons' pattern variables.
- b. Elements of AGIL emphasized.
- c. Evaluation of the technical system of attitudes, norms and interactions surrounding present tasks in the technological situation.
- d. Historical perspective.
- e. Means of social control.
- f. Norms effective
- g. Basic Attitude Structure
- h. Class Structure
- i. Sentiments
- j. Authority
- k. Work Rhythm
- l. Present Work Incentives

III. How are they related How can they be related

- a. How is present technical status related to present social equilibrium?
- b. How are potential develop-ments related to the present social equilibrium?
- c. How are desired develop-ments related to the present equilibrium?
- d. What changes would be necessary in the present social equilibrium to accomodate the desired technical adjustments?