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Authors
Hoffman, Richard B
Archibald, R. W

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Berkeley, California 94720

RICHARD B. HOFFMAN
R. W. ARCHIBALD

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Introducing Technological Change in a Bureaucratic Structure: A Case Study

RICHARD HOFFMAN
State University of New York at Buffalo
and R. W. ARCHIBALD
the RAND Corp.

INTRODUCTION

This paper describes some problems encountered in attempting to introduce technological change into an urban protective service agency. The study was undertaken in response to the desires of the National Aeronautics and Space Administration (NASA) to disseminate information developed as part of the national space exploration program. In the course of the research a cooperative relationship was established with a public protective service agency, and this paper describes the concepts underlying development of that relationship and the results obtained using a participative group as a basis for the relationship.

THE BUREAUCRATIC MODE

It was clear early in our research that the degree of cooperation needed between the researchers and the managers of urban public services would be much greater than was anticipated originally. Recognizing the need for a meaningful participatory relationship, we began to investigate the bureaucratic nature of the organizations with which we were dealing.[1]

We view a bureaucracy as a formal organization constructed around a rational ideal, with each of the participants efficiently performing his assigned tasks in accord with defined objectives. The characteristics of bureaucracies are much discussed in the literature and are clearly exhibited in municipal police and fire departments. One characteristic of

[1]See R. B. Hoffman, "Notes on Bureaucracy, Risk, and Reward Structures," Mimeographed, 1968.

a bureaucracy, its definition of error, is particularly important. To operate effectively a bureaucracy must have considerable conformity to rules and high predictability of performance. Such conformity and predictability are sought through elaborate task specification and carefully proscribed lines of authority. The result is a system of "specialists."

In a changing environment conformity and predictability are difficult to maintain. The bureaucracy must greatly increase its efforts to provide guidelines, tighten discretionary powers, and monitor performance. In this more realistic framework, the stochastic nature of either inputs or outputs plays havoc with the bureaucratic ideal. Once results cannot be specified precisely, human judgment must replace impartial application of rules and a primary tenet of bureaucracy crumbles. Since most modern bureaucracies do not operate in neatly ordered environments, there is a constant tension between the forces of bureaucracy (devise a rule, establish standards, develop a specialist) and the forces of change (adapt, be innovative, take risks).

Before discussing some of the past efforts to foster change in a bureaucratic setting, it is necessary to look more carefully at the general form of our case study organization: the municipal uniformed service bureaucracy.

PUBLIC PROTECTIVE SERVICE ORGANIZATIONS

The municipal police and fire services are para-military organizations. Their bureaucratic structure and particularly their specification of rules and discipline find direct precedence in military organization. Both public protection bureaucracies and military bureaucracies are crisis-serving organizations.[2] Their members are trained and disciplined to react to tense, demanding, and relatively rare events. As such, the strong discipline developed in military organizations has served as a viable example for police and fire departments.

This crisis-oriented approach cannot be turned on and off, however, and consequently it carries over to the routine, daily operations of these organizations. In the daily routine this behavior may not be as appropriate. Since adherence to the rules and continued reliability are demanded during the periods of stress, the crisis orientation dominates any more relaxed, less formal bureaucratic aberrations. Initiation of change, always difficult in a bureaucracy, is even more difficult when rules and regulations are published regularly in an imitation of the "orders of the day."

Also, in a direct comparison to the military, police and fire bureaucracies are self-perpetuating organizations, in-bred and possessing what

[2]Cf. M. Janowitz, *The Professional Soldier: A Social and Political Portrait* (Glencoe, Ill.: Free Press, 1960).

Veblen termed "trained incapacity." Leadership picks its own successors and naturally tends to pick successors whose values are closely aligned with its own. Choice of the candidates is usually restricted to those individuals who have already been through a long acculturation process and there is little likelihood that individuals with values much different from those of the organization will survive to become candidates for organizational leadership.

Consequently, managers in these bureaucracies usually hold those values predominate throughout the organization and they adjust to environmental pressures in a manner consistent with established mores of the system. The common approach is to make marginal recombinations of inputs, attempting to retain some equilibrium without an explicit consideration of outputs. Since managers acquire a vested interest in smooth operation, they usually do not perceive major change as a real alternative. Change means uncertainty, and change may require adjustment in values — two situations likely to disrupt smoothly running operations. Any perception of bureaucratic managers as innovators is more a hopeful prescription for the future than a description of current practice.[3]

A peculiar characteristic of police and fire bureaucracies that is most crucial when considering change and adaptation to a changing environment is that there is but one entry level in these organizations: the bottom level. Here a crucial aspect of professionalism enters. In the same manner that the typical bureaucrat becomes a specialist, playing a carefully designed role with almost dilettante precision, so the bureaucrat in a police or fire department becomes a "professional," fulfilling a demanding role which requires skill and experience "that can only be gained through in-house training and experience."

The characterization of a professional as having bureaucratic tendencies may seem to be a contradiction in terms. Nevertheless, professionalism and bureaucracy can be made to blend together nicely.[4] For many years the municipal police and fire services have served as chief examples other than the military of a blending of professionalism in thought and bureaucratic organization in practice. Although there have been few significant changes, there is a developing tension between aspects of bureaucratic organization and professional practice.

Another allied aspect of police and fire bureaucracies is the slow, reluctant acceptance of staff positions as meaningful complements to organizational structure. The majority of police and fire departments are strongly biased in favor of line duty. They tend to regard management and staff positions as unfortunate requirements. An extreme manifesta-

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[3]James G. March and H. A. Simon, pp. 185, 189.

[4]E.g., Mark Abrahamson, *The Professional in the Organization* (Chicago: Rand McNally, 1967); Howard Vollmer, *Professionalization* (Englewood Cliffs, N. J.: Prentice Hall, 1966).

tion of the fear of transfers or "promotions" can be seen particularly in the fire bureaucracies. Almost without exception in the United States, the top manager—Chief of Department—still commands operations at working fires.

Judgment, though necessarily a daily part of bureaucratic activity, is that activity which cannot be carefully specified, that activity where the risks of error are high and the organizational cues minimal. In those areas where organizational cues are minimal, the national professional organizations attempt to provide guidelines; thus it is not unnatural that these areas should become sources of conflict among professional, organizational, and individual goals. Many national organizations, striving to establish activities as truly professional, set the stage for conflict between the individual as bureaucrat and the individual as professional.

The special knowledge required to accomplish specific technical changes is changing more rapidly than even the most flexible organizations seem capable of adapting to it. Since legitimacy for technological change is generally established by expertise rather than position, the fundamental organizational structure of authority is invariably strained when this type of change is contemplated. The authority and influence derived from position may be accompanied by influence and respect derived from knowledge and established informal authority. However, in public bureaucracies, it has been more likely that authority consonant with position dominates authority based on technical knowledge and expertise.

The remainder of this report touches briefly upon some common strategies for bureaucratic change, then reports upon the authors' attempt to generate change in a typical municipal bureaucracy.

BUREAUCRATIC CHANGE

Bureaucracies attempting to accommodate change have used two basic strategies. The first is to establish a group within the bureaucratic structure, imbue it with the needed legitimacy, provide it with needed resources (mainly talent), and attempt to integrate its activities into the normal operation of the bureaucracy. Such groups range all the way from high-powered, technically qualified staffs operating as assistants to the top decision maker to burial committees, convened to use a perceived need for change as a force to further entrench an existing structure. The other alternative is to bring outsiders into the organization, to hire consultants. This strategy can also range from a serious and concerned effort to an elaborate (and usually expensive) ploy. Additionally, there are many mixed strategies, requiring various combinations of internal and external assistance.

The experience with specially established in-house groups has varied widely. In security conscious organizations, such as police bureaucracies, the barriers to successful innovation can be difficult to destroy. These barriers include both the bureaucratic phenomena of functional specialization and a traditional, "professional" orientation which renders nonprofessionals as secondary citizens. O.W. Wilson, in a review of police planning and research groups, found that the bulk of their effort is what administrative theorists might classify as "organizational maintenance" work.[5] Though these "planning" groups in some cities have tried to innovate, the vast majority still find themselves captured or co-opted by the system. Robert Merton stated the difficulty clearly when he observed that the bureaucratic intellectual "who must permit the policy-maker to define the scope of his research problem is implicitly lending his skills and knowledge to the preservation of a particular institutional arrangement."[6]

One possible way to reduce the institutional barriers to consideration of original alternatives is to hire consultants to survey a problem or broad area of difficulty and to present findings or recommendations. This has been the most popular approach taken by municipal bureaucracies. Perceptions of severe resource constraints, lack of available talent, and failure to acknowledge enduring problems have provided the primary impetus to this approach. Most bureaucracies feel they cannot afford to staff a permanent, high-powered research group and (as part of their traditional biases) have long felt that such a group would not have that much to do anyway. The consultant is an attractive alternative. Also, since recommendations are then the result of work by outsiders, hiring consultants to spearhead change is probably the safest approach the bureaucracy can take.

In many respects the consultant approach is safer than doing nothing. Inaction, particularly if antagonists inside or outside the bureaucracy perceive difficulties, can lead to investigations (blue ribbon committees, boards of inquiry, etc.), and the results of the investigation can provide antagonists with fuel for the institution of drastic changes. Since the consultant must have information to conduct his study, and often only the bureaucracy possesses that information, by selectively cooperating with the consultant the bureaucracy can effectively scuttle desired change. When the consultant rises to present his conclusions, the bureaucracy simultaneously rises to ask whether "the very obvious" factor n was taken into account; when the consultant indicates that it was not in the set of provided data and hence was not taken into account, the bureaucracy produces the necessary information—information which just happens to show that the consultant's conclusions are inappropriate. This is just one of innumerable scenarios that would describe, admittedly slightly in caricature, experience

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[5]O. W. Wilson, *Police Administration* (2nd ed.; New York: McGraw-Hill, 1963).

[6]Robert K. Merton, *Social Theory and Social Structure* (rev. ed.; The Free Press of Glencoe, 1957), p. 218.

in the use of consultants to bring about change in bureaucracy. This is not to say that consultant experience in bureaucracy has been all bad; there have been many examples of success. Nevertheless, the popularity of the method attests to either the slow learning ability of public bureaucracies or the usefulness of the technique in maintaining organizational stability while giving the appearance of imminent change.

The next section describes one attempt to bring about change. This attempt did not use the in-house staff approach nor the consultant approach, but an intertwining of elements of the two approaches.

A JOINT TASK FORCE APPROACH

Our initial approach to discovering potential for technological transfer was to develop a detailed understanding of the organization, its goals, and its needs. The study began with a comprehensive interview program. Interviews were conducted with a sample of officers of various ranks, assignments, and geographical locations.

The interviews allowed us to gain a detailed knowledge of both the basic operations and the existing technology of the case organization. During the interviews, explicit questions were asked to determine the areas in which members of the department felt technological improvement might occur. This questioning resulted in a list of over 200 possible items of varying degrees of generality, importance, and feasibility. These items and items generated independently by the researchers were reviewed and classified into categories of varying importance and level of generality. Seven broad areas were classed as having substantial potential for improvement primarily through the introduction of advanced technology. After an elaboration and classification of the items it became apparent that since so many of the items overlapped, a detailed analysis of each would be an inefficient and perhaps unfeasible procedure. Hence, it was decided to select only the areas with the greatest potential for improvement; a special study was begun to select these areas.

At this point it was apparent that the organization, bureaucratic or not, would have to become more fully involved in the definition and search process. It is clearly necessary to know the proper questions to ask, but if technological change is to be successfuly implemented the organization must be fully involved and committed in the selection and testing process. We decided to encourage fuller participation and then attempted to devise an approach that might avoid the pitfalls of a straightforward advisory group. The evaluation of our approach has been accomplished in part by analysis of a questionnaire administered to both those individuals originally interviewed and to a stratified sample of the remaining officers. Results of the questionnaire are noted after a number of our assertions.

Creation of a suitable relationship posed several problems. Though there was ample evidence of a felt need for change (28 of 44 respondents, or 58.3%), responsibility for initiating, reviewing, and implementing change was fragmented throughout the organization. There was a relatively active safety group within the organization and there had been at one time the beginnings of a "research committee." However, at the time of the development of the approach, there was no active planning, advisory, analysis, or research group. The safety group was perceived by a few members as an agent of change (6 of 44 respondents, or 13.6%), but it actually served primarily as a review group and then only sporadically.

The bureaucratic structure and work schedule of the organization combined to make change an extremely difficult procedure. Though members often mentioned that they had made suggestions for change (26 of 46 respondents, or 56.5%), they were seldom able to explain what happened to the suggestion or to what review process the suggestion would likely be subjected. More than one officer realized that the organizational structure was a constraining influence. But they felt individual action would not be sufficient to change the structure.

Considering both the basic reticence to change of the organization and the technological nature of the anticipated changes, it was decided to follow a course championed by Douglas MacGregor and to take a participative management approach.[7] As soon as it was felt that problem areas were sufficiently well defined to make participation meaningful, a task force was established. This task force included representatives of the university research group and a representative sample of the top and middle managers of the case organization. Our conviction that participation was a proper approach was strengthened by the fact that the participation could be made meaningful. The task force could help define problems, specify areas of needed improvement, and bring relevancy to the research effort. In return, exposure of the organization members to the rigors of carefully specifying objectives and analyzing technological deficiences would be of enduring benefit to the organization.

The task force would further the objective of technological transfer in several ways. First, if we were successful and persuasive, we could develop a committed group, with a vested interest in continuing beyond the initial exploratory investigations. The case organization required a considerably stronger commitment to change if there were to be any hope of transfer occurring. The task force appeared to be the vehicle which could provide a forum to build this commitment. Creating the vested interest is not an easy task, but once created it can propel a proposal forward with amazing speed.

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[7]Douglas MacGregor, *The Human Side of Enterprise* (New York: McGraw-Hill, 1960).

Second, discussions within the task force would allow us to assess probable reactions to change and insure that typical reactions were accommodated in reports and recommendations. Recommendations are frequently rejected because of simple, easily-corrected objections, and to the extent that the task force provides a forum for thoughtful interchange, all but substantial disagreements can be disposed of. In essence, the task force provides opportunities for innumerable "dry-runs" of ideas and proposals. Since members of the organization are members of the task force, their own questions and critical evaluation provide a built-in screening process.

Finally, the task force would introduce a semi-formal communication channel within the organization. The normal channels followed typical bureaucratic patterns, and although there were some well-developed informal channels, the task force provided a medium for exchange uncommon in the department. It was a deliberate strategy on our part, however, not to include the leader of the university research effort nor the acknowledged superior officer in this area within the organization. Both were acknowledged as ex officio members and were given the task of advising the task force and evaluating its work. Since both individuals were dominant personalities and both held positions of perceived leadership, it was felt they could easily have monopolized the group. Hence, to prevent the possibility of sabotage to our effort to generate wide participation and support, the superior officer was to be convinced that both leaders should fill advisory and evaluative roles.

The task force was organized so that representatives of the university might raise various issues regarding the protective service technology and the members could bring their practical experience to bear in helping to clarify these issues. Both the university and the department felt it important to establish a dialogue between the researchers, who were studying department's problems, and the members, who were dealing with them every day. The force organized itself around the notion of assignments, so that the issues raised by university personnel were examined by the entire task force and then assigned to individual members of the task force for detailed analysis. Thus each meeting consisted of a discussion of the work done by the members and analyzed by the research workers and a general critique of work done by the university people in response to the assignments.

The early work of the task force was not totally appreciated by its members. It took time for the task force to develop a feeling for its role in the process of technological innovation. In general, the protective service members felt that each effort would have a physical, tangible output immediately after submission. There seemed to be a perception that science, in general, and NASA, in particular, would be able almost immediately to transfer requests from the task force into direct physical products. Once it was realized that technological improvement is a lengthy

process, the direction of the task force's efforts became more sensible. During the short life of the task force, its operational members have begun to understand more about the process of innovation on the one hand and the introduction of change into an organization on the other.

After several sessions the procedure of the task force was altered, so that issues raised during the general task force meetings would be carefully analyzed at internal meetings with only members of the case organization participating. Establishment of internal meetings was particularly appreciated by us because it indicated a realization that our concerns related to basic rather than specific problems, and though we could have significant influence on solution of some of the organization's problems, lasting operational solutions would require major participation by the department's members. With this structure, the task force meetings became more fruitful and covered more material in a shorter time.

This was the type of breakthrough we had desired; the operational members became enthused about their problems, and felt they could move forward much more rapidly than the original task force structure allowed. This change in structure also signalled a subtle but easily discernible change in the group's mood about leadership. The researchers had led the way in the early meetings, essentially belaboring a careful problem definition approach to technological change. Once the task force grasped this approach they were anxious to move forward with their own leadership. From this point on, the task force became more of a reality within the department. The operational membership began to change and procedures to test and evaluate proposed innovations were formalized. As the force gained momentum within the organization, the researchers began to ease themselves into less significant roles. Finally, as the case organization committed some of its own resources to acquisition of physical items to be tested in the field, the university dropped its formal participative role. The task force is now composed entirely of organization members and the university provides informal feedback on a sporadic basis.

CONCLUSIONS

In evaluating the results of our intrusion into a bureaucratic structure, it is helpful to remember our original intent. Our purpose was to foster a particular type of change in a specific type of organization. The change was expected to be primarily technological, with the usual complement of social and political side effects. Specifically the change was to be accomplished by a transfer from one universe of discourse to another. Thus, not only was the change to involve specialized knowledge, it was also to involve knowledge not present in any familiar organization. What little stature the specialized knowledge could muster was obtained from the grand mantle of science.

In terms of the spectacular technological or managerial breakthrough, we were unsuccessful. Our case study organization has not revolutionized its operational methods or equipment. It is utilizing the same basic technology of three years ago and it does not appear to be on the threshold of any great technological change. However, the organization has institutionalized the investigation and testing of new technological developments and has allocated some of its own resources to continue this endeavor.

In one sense, the commitment of resources represents a singular success, for if the case organization continues to act in a bureaucratic fashion (and it surely will), then a continuing allocation will most likely be the norm. More important, we are convinced that our intrusion into the case organization has created a sentiment, as well as a communication channel, for introducing change.

Once the task force placed items in the field for testing, or began questioning a wide spectrum of members in order to define a problem, a snowballing effect began to take place. As the task force began to seek feedback from a growing number of individuals, it gained momentum as an accepted and recognized part of the organization. This momentum then led to further interchange, and a perception was molded throughout the organization that the task force was a legitimate part of the organization structure. In addition, the reports produced by the group, though not generally available throughout the department, were read by a large proportion of department officers (20 of 48 respondents, or 41.7%).

Thus, whether or not any particular item or approach was directly transferred from the space technologies to the case organization, a new unit within the organization has been created and given a life. This unit serves an important role in the organization and is providing a forum for legitimate discussion of change. Without it, the chances for significant technological change in this type of organization are minimal.

There were, in the course of the growth of the task force, some general, unanticipated consequences. Some members took much greater individual roles than expected. The latent desires to explore new ideas in a relatively riskless atmosphere blossomed in some members, and they took an active individual role in seeking useful information for both the task force and the organization. The task force thus provided the impetus for considerable further probing by individual members.

Also, though this was somewhat anticipated, the task force provided a commodity in short supply, managerial slack,[8] which allowed some time for exploitation of latent or suppressed initiative. The case organization

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[8]Cf. Richard M. Cyert and James G. March, *A Behavioral Theory of the Firm* (Englewood Cliffs, N.J.: Prentice-Hall, 1963), pp. 36-38.

provided little opportunity or encouragement for collective "thinking ahead" activities. It was necessary to create some time "allowed" for such activity to obtain meaningful participation. The task force provided just such time and accompanying legitimacy.

The adjustment in group process to provide for the internal working sessions mentioned earlier was completely unanticipated. However, fortunately, this considerably increased the organizational commitment and task force performance.

We also expected that some of the risk of initiation would be transferred to the researchers, but we underestimated the importance of this. The task force significantly shifted the risk of failure from inside to outside the organization. In our judgment, given the reward and risk structure of the organization, this factor was critical for obtaining active participation. Part of this, of course, was the promise that "science" would really be doing the work; but still a substantial part was attributable to our reducing uncertainty in the reward structure and creating a medium where change or the investigation of change was rewarded, regardless of the substantive aspect of the discussion. We tended to bring some symmetry back into the reward structure, so that critical evaluation and suggestion for change were normal rather than exceptional behaviors for at least the task force members.

Our conclusions about technological change are rather tentative. Our conclusions about change in a bureaucracy are more emphatic. The primary constraints to change in bureaucracy are the risk structures, the reward structures, and the structure of the organization itself. The task force approach was successful in adjusting all three of these constraints.

First we transferred to outside the organization an important segment of the risk of proposing change and by so doing relaxed one of the critical barriers to wholehearted cooperation and participation. Second, we established a norm of participation based on critical evaluation and initiation of change, thereby shifting the normal reward structure back toward symmetry. This did not occur throughout the entire organization, but it was the predominate mode of the task force. In fact, there was substantial disagreement at times among task force members and other top decision makers in the organization, disagreement generated in great measure by the freedom of expression that was the norm in the task force.

Criticism is always difficult for a bureaucratic organization to absorb, and the task force was at times openly, but quite fairly, critical of both organizational procedures and the performance of equipment used by the organization. The task force indeed weathered some rocky moments when its mode of expression failed to conform to the organizational norms.

Finally, the task force represented a significant aberration in the organizational structure and as such was able to circumvent some of the

usual organizational constraints. Because we were able to begin with a group which included several high ranking officers, we were able to create a coalition.[9] The combined influence of outside authority and several ranking officers was sufficient to introduce what in effect was a bargaining process within the organization. Though it would be presumptuous to say that informal coalitions did not exist before the task force was instituted (they did), the task force was the first clearly visible unit within the organizational structure which could be perceived as a "lobby" for technological change; and though to our knowledge it was never publicly acknowledged by members of the task force or by top decision makers, the mode of change was implicit bargaining.

This experience with a task force approach has convinced the authors that chances for significantly affecting organizational change are considerably enhanced by a participative management approach. Indeed, the extent that recommendations are likely to be implemented and innovative ideas generated and acted upon is undoubtedly a function of the amount of meaningful, individual participation in the change process. Since roles as agents of change are not usually provided for in bureaucratic organizations, provision must be made within the organizational structure to accommodate participation.

The task force approach is one that has successfully provided opportunity for meaningful participation in attempts to influence important change in a bureaucracy. Participatory management can be made to work in a bureaucracy when innovation is the goal of change.

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[9]Victor Thompson; Cyert and March, pp. 29-31.