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A PROBLEM IN SUBOPTIMIZATION	DEVELOPMENT
by	CORPORATION
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April 8, 1968	SANTA MONICA
	CALIFORNIA 90406

Paper and commentary presented by W. W. Herrmann at the Second National Symposium on Law Enforcement Science and Technology, conducted by the Law Enforcement Science Technology Center, IIT Research Institute, on April 16, 1968



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SP-2989

ABSTRACT

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Strategies and tactics relevant to increasing the efficiency and/or effectiveness of an administration-of-justice "system" may be at considerable variance with the strategies and tactics appropriate to a "system" for optimizing public order and security within the constraints implicit in a free society.

Both the scientist and the technician have responsibilities to the law enforcement community in assisting with the complex task of explicating the ramifications implicit in the selection of objectives and the choice of approaches-technological <u>and</u> conceptual--to be implemented.

2

SP-2989

ACKNOWLEDGMENT

Some of the concepts embodied in this paper have previously been articulated by the author at the December 1965 Conference of the American Association for the Advancement of Science. The author wishes to acknowledge the many contributions of General Robert C. Richardson, III, who at that time was DCS for Science and Technology, Headquarters, Air Force Systems Command, United States Air Force.

SP-2989

PUBLIC ORDER IN A FREE SOCIETY: A PROBLEM IN SUBOPTIMIZATION "'The time has come,' the Walrus said, 'to talk of many things'...."

3

Now it is not the intended purpose of this paper to talk of shoes, ships, sealing wax, cabbages, or kings. It would appear, however, that the time has indeed come to talk of many things that are related to the subject of crime and the avowed intention of "doing something" about its control.

There has, of late, been an increasing amount of emphasis placed upon the subject of crime. There has even been talk of arranging a tryst between the notorious entity we call <u>crime</u> and the contemporary Prince Charming we call <u>science</u>. At very least, we have sought to arrange an alliance between crime and the stepbrother of science--technology. A few bold souls have contended that the phenomenon of crime is a worthy recipient of the attention of scientists and engineers. There does seem to be a growing acceptance of the notion that the problems associated with crime can somehow be reduced to more manageable proportions through the application of science, technology, and/or scientific methods. This idea has begun to receive an encouraging reception from some individuals responsible for the administration and operation of various substantive phases of the law enforcement spectrum. It is also a view that is shared even by an occasional scientist.

The underlying assumption appears to be that if the two prospective partners can be properly introduced, and a budding romance carefully nurtured, eventually some sort of more permanent union--sanctified by the necessary contractual rites--will produce offspring capable of growing to productive adulthood. However, as we all know, confusing nubility with fertility can frustrate even the strongest desire for offspring.

4

The nature of the problem of trying to produce a fruitful union between crime control and either science or technology is such as to call for the services of several very competent matchmakers. It is a problem that is somewhat more complicated than the Pickwickian approach to defining Chinese Metaphysics, i.e., define Chinese, and define Metaphysics, then combine the two definitions for a definition of Chinese Metaphysics. The problem requires an awareness of the more than merely casual relationship that exists between objectives, requirements, existing capabilities, limitations and constraints. Similarly, the problem requires a mutual understanding of what each partner proposes to contribute to the "marriage."

Before we can really begin answering the questions of what should be done, and who has the capability and/or responsibility for what activities, it would seem almost mandatory that a preliminary problem be addressed. There must be some agreement relevant to--if not an immediate understanding of--the present and probable future scope of assistance to law enforcement. Of at least equal importance. it would also be of somewhat more than academic interest to gain some insight into the present and probable future scope of law enforcement.

SP-2989

SP-2989

Thus, we may see that when we speak of objectives we are actually addressing two separate, but related, sets of objectives. One of these sets relates to the objectives of the various legislative aids to law enforcement. These have been spelled out in the Acts themselves, the comments of members of the House of Representatives, and the discussions on the floor of the Senate. They have been enumerated by people associated with both the President's Crime Commission and the Office of Law Enforcement Assistance. They are also being discussed with varying degrees of coherence and clarity by people involved in the processes of law enforcement. The other set of objectives relates to the somewhat less well-defined objectives of law enforcement <u>per se</u>. Although there is, hopefully, an existent interdependence between the two sets, it must be pointed out that, at least at this time, they are by no means identical.

To help put this matter of law enforcement objectives in perspective as it relates to operative factors in the real world we might build a simple model. It is possible, perhaps, to indicate by the use of this representation of reality the relationship that exists between objectives, requirements, constraints and capabilities that are unique to given points in time and space.

Suppose for a moment that we were to take a blank piece of paper and draw upon it a large rectangle, as in Figure 1. We now have areas of the surface of this paper that differ in at least one important respect. Some portions of the paper are inside the boundaries of the rectangle, while others are outside. Let us identify the area within the rectangle as being representative

FIGURE 1: ENVIRONMENTAL GESTALT: THE SET OF ALL THINGS--TANGIBLE AND INTANGIBLE; ANIMATE AND INANIMATE--COMMON TO A GIVEN LOCALE. E = ENVIRONMENTAL GESTALT

6

April 3, 1968

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SP-2989

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SP-2989

of all the people and thin s which, when taken together, go to make up a given geographic/political area. We might, if we wish to lend a semblance of academic dignity to our activity, refer to the area within the rectangle as any given Environmental Gestalt.

7

We now have a piece of paper upon which is drawn a "box." This box contains all of the things--animate and inanimate, tangible and intangible--that make up a particular geographic/political entity. Our box contains government agencies, private agencies, individuals and groups, people--wealthy people, poor people, old people, young people, employed people, unemployed people--and a host of other things, both tangible and intangible, that all have at least one thing in common. They are all to be found within the borders of our box. To be sure, there are other boxes in the world; but we can't be quite positive yet that the contents of all these other boxes are equal to the contents of our box in terms of quantity, quality, or diversity. Earlier, we referred to our box as an <u>Environmental Gestalt</u>; we could also have called it a <u>universe</u>. We could also just as well have called it Los Angeles, Chicago, Washington, New York, or any other area you wish.

Now, suppose for a moment that we were to concentrate our attention upon a particular portion, or <u>subset</u>, of our box full of things. This object of our attention we will identify as the <u>set</u> of all government agencies that exist and/or operate within the confines of our <u>Environmental Gestalt</u>. We can represent this aggregate of government agencies by drawing another, somewhat

April 5, 1965

SP-2989

smaller, rectangle, as in Figure 2. We might, for the sake of convenience, label this new box--the set of all government agencies within our environment-with the letter "G."

8

Now, let us put the box representing all of the government agencies <u>inside</u> our larger box that formed the basis for Figure 1. This relationship is represented in Figure 3.

In any representative urban area the number of different government agencies is, to put the matter rather mildly, quite large. For the moment, however, we are primarily concerned with that <u>subset</u> of government agencies that is related to our <u>present</u> concept of law enforcement. It is quite within the realm of possibility that as increasing attention is devoted to the <u>objectives</u> of law enforcement--as opposed to the <u>processes</u>--a view of methodologies and/or resources will result that is at considerable variance with a contemporary listing of what we presently view as "law enforcement" agencies. However, for the present, we can take our smaller box and place inside of it a circle. This circle may be used to represent that subset of all government agencies having more or less direct relevancy to contemporary perceptions of the law enforcement function. For purposes of identification, we might label this circle \mathbb{Q}_{t} , as indicated in Figure 4.

Thus, all of the government agencies dealing with law enforcement are reprecented as heing within <u>both</u> box G and circle G_L . All of the other government agencies not greatly associated directly with our concept of law

G = GOVERNMENT AGENCIES

9

FIGURE 2. THE SET OF ALL GOVERNMENT AGENCIES OPERATIVE IN A GIVEN ENVIRONMENT. SP-2989

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SP-2989

FIGURE 4. THE SUBSET OF ALL GOVERNMENT AGENCIES RELATED TO LAW ENFORCEMENT G_L, WITHIN THE SET OF ALL GOVERNMENT AGENCIES G, THAT IS WITHIN A GIVEN ENVIRONMENTAL GESTALT, E. υ . س

April 8, 1968

11

SP-2989

SP-2989

enforcement--health, fire, public works, welfare, libraries, schools, etc.--are within box G, but they are <u>outside</u> of the area covered by circle G_L . Further, all of the other entities in our selected environment are within the large area E, but outside of box G.

To continue belaboring the obvious, we know that within the subset G_{L} --government agencies dealing primarily with matters of law enforcement--there are many elements.

There are many ways to group, or categorize, these elements. Here, we shall group them according to their more or less traditional functional descriptions. There are the police, the courts, the prosecuting agencies, probation authorities, corrections agencies, and so forth. Although it is gradually becoming recognized that realistic crime control programs must contemplate some form of integration of the activities of all of these agencies, we might stipulate here that for purposes of discussion and illustration, our principal concern is with that element of the subset of law enforcement agencies commonly referred to as the police. We can depict the relationship of the police in this context by drawing a smaller circle within circle G_L to represent the police. This smaller circle can be labeled G_{LP} , as in Figure 5.

Presumatly, each of these agencies of government exists to achieve objectives. Thus, we might assume that for the set of all government agencies, G, there also exists a set of related objectives, 0^{G} . Similarly, for the subset of all

FIGURE 5. THE ELEMENT OF POLICE--GLPAS A COMPONENT OF THE SUBSET OF THOSE GOVERNMENT AGENCIES RELATED TO LAW ENFORCEMENT--G1 --THAT ARE BUT ONE PORTION OF THE SET OF ALL GOVERNMENT AGENCIES -- G--WITHIN A GIVEN ENVIRONMENT--E. ტ w

April 8, 1968

13

SP-2989

SP-298€

government agencies that are more or less directly related to law enforcement-- G_L --there exists a corresponding subset of objectives, O^{GL} . And for the particular element of the subset G_L that we have identified as G_{LP} (police) there also exists an appropriate group of objectives, O^{GFL} . By reiterating the same general process already described with reference to the relationship between government agencies we can also reflect the relationship existent between the various levels of objectives. A representation of the presence of government agencies as well as the existence of objectives within the confines of our given environment is reflected in Figure 6. One of the obvious issues at this point is the degree of compatibility between the different sets of objectives.

Before continuing with a discussion of objectives, it might be well to reflect in our model the presence of what have previously been referred to as <u>constraints</u>. There are certainly many, many ways to identify and/or categorize constraints. The specific labels, however, are not of critical importance at this point. What is of critical importance, however, is a recognition of the impact that these constraints have upon not only agency activities, but upon agency objectives as well. With reference to objectives, the impingement of these constraints is not only upon the perception and selection of objectives to be achieved, but upon the perception and selection of methods available for employment in attempting to achieve the objectives. Further, these constraints also relate to the perceptions of police objectives and methods that are common to other entities within a given environment.

April 8, 1968



SP-2989

SP-2989

In a very real sense then, these constraints may be viewed as <u>determinants</u> of both agency perception and agency response. Similarly, they are determinants of the community's response to agency activities. For our purposes here, and in keeping with the present tendency to form acronyms, we might identify the aggregate of these constraints as the STAPLE from which is derived what is sometimes referred to as operative public policy within a given area. The acronym is derived from the first letters of the <u>Social</u>, <u>Technological</u>, <u>Administrative</u>, <u>Political</u>, <u>Legal</u>, and <u>Economic constraints</u> that are operative at any given point in time within a discrete area.

16

To represent the set of all constraints that are operative within a given environment we will once again draw a rectangle. We will then place this "box" within the bounds of our environment to represent the fact that it is a subset of the total environment. Within the confines of this new box we will draw circles to indicate the presence of the previously identified constraints as major elements of the set of all operative constraints. After indicating the identity of these elements, we then have a model of our environment that is reflected in Figure 7.

In Figure 7, it will be noted that the elements within the set of constraints have been indicated as independent entities. Obviously, this is not quite correct. It would appear that there actually exists a relatively high degree of interaction and interdependency between these elements. Although we can identify the maximum and minimum number of possible interactions, we cannot

April 8, 1968

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SP-2989

18

April ., 1960

SP-2989

say too much at this time about the nature of the interactions and the specific interdependencies. Nor can we shed any appreciable light on the resultant effect upon either the agencies or the objectives. ... e cannot do much more than hypothesize at this juncture about the probable effect that a change in the Social determinants, for example, would have upon the impact and/or alterations of, and in, Legal, or Economic, or other constraints. Certainly, a matter of considerable contemporary concern is an assessment of the impact of alterations in technological constraints.

One of the more important, but perhaps at this point less apparent, implications for both law enforcement planning and law enforcement assistance planning is the necessity for acquiring the capability--and, hopefully, the willingness--to assess, anticipate, and accommodate the effects of evolving patterns of interactions between these constraints.

A given agency, in attempting to achieve objectives, operates in a given environment containing, among other things, the previously mentioned constraints. Further, the resources allocated to the agency are translated, as a function of the constraints operative at a given point in time, into configurations of Feople, Procedures, and Machines, i.e., Systems. An attempt to depict this relationship is provided in Figure 8.

April 8, 1968



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SP-2989

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SP-2989

One may also hypothesize that there is a relationship between the degree to which objectives are either achieved, or not achieved, and the effect that this may have in producing alterations within the set of constraints. By extension, one could also infer that in some instances alterations in constraints could have more or less direct impingement upon the agencies themselves.

In this sense then, we have derived a model--hypothetical at this time to be sure--of the relationships that exist between government agencies in general, law enforcement agencies specifically, objectives, and operative constraints within a given environmental set.

With the foregoing serving as a sort of preamble, then, it may be seen that there is first of all a real need for some initial statement of objectives. This is as true of law enforcement systems as it is for any other substantive field of endeavor. There must also be an evaluation of the objectives stated in terms of: (1) priorities; (2) interdependence; and, (3) compatibility with contemporary constraints. In this vein, it should be stressed that political and social value systems are certainly very important constraints.

The determination of priorities is, unfortunately, necessary because of the necessity for making decisions concerning the allocation of relatively scarce resources among programs directed toward the achievement of specific objectives. In short it may be possible, even correct, to assume that <u>all</u> objectives are important. Put, apparently when there are insufficient resources available to

SP-2989

attempt the achievement of all objectives, <u>some</u> are found to be more important than others.

21

The assessment of the degree of interdependency between objectives is of considerable importance from at least two standpoints. One of these is to be found in the situation wherein what might be referred to as a sequential relationship between objectives is involved. That is, in order to achieve a given objective, it is altogether possible that some other objective must be accomplished first. Here, for example, we see that in order to try an individual for some offense there must first be a legal basis for the trial and also that the offender must be apprehended. Another situation wherein the matter of priorities comes into prominence is found in the case where objectives are dependent upon some common reservoir of resources. Resources allocated to the achievement of one objective cannot, generally, also be allocated to the achievement of some other objective. For example, money that has been allocated for the operation of a police department cannot also be allocated for the operation of a correctional institution. Money that is used to pay salaries cannot also be used to purchase equipment. This facet of decision-making has been identified in contemporary literature in the fields of system design and operations research with the concept known as sul optimization.

April ., 1.

22

SP-2989

The analysis of objectives from the standpoint of identifying areas of interdependence also assumes more than casual significance in those instances wherein it is found that the more effective one segment of a total system is in accomplishing its objectives, the less effective some other segment can possibly be under given conditions. For example, consider the situation where a large police department acquires the capability to significantly enhance the percentage of crimes within its jurisdiction cleared by arrest. This may represent a most commendable achievement from one standpoint. However, let us assume for a moment that the increase is only a fifty per cent improvement. Instead of clearing twenty-seven per cent of its crimes by the arrest of perpetrators, the department now clears some forty per cent. This may mean something like 35,000 additional arrests each year. The impact of this increase in the number of arrests now begins to impinge on the capabilities of other entities within the system, i.e., the prosecuting agencies, the courts, the probation departments, and the corrections agencies, to mention but a few. With out a corresponding increase in the capabilities of each of these related agencies, it is altogether probable that the whole system will break down because of the isolated "improvement" in one of the subsystems. On a smaller scale we might stipulate that a given force is expected to: (1) answer calledfor services; (2) provide visible patrol; and (3) make arrests for violations. If each element of the force is "successful" in accomplishing task 3, for example, it is clear that while engaged in the activities associated with this function, they can't also be doing tasks 1 and 2.

April 8, 1(68

SP-2989

Objectives, once agreed upon, must be viewed in context with an assessment of contemporary constraints. One way, admittedly an oversimplification, of viewing the relationship between constraints and objectives is to liken the constraints to the steep banks of a widening river. One of these banks might represent the technological constraints and the other nontechnological constraints. Our objectives may be viewed as destinations we would like to achieve. Some of these destinations are within the banks of our river. Some of them are on dry land, considerably outside the limits of our river. Thus, in Figure 9, we see that objectives A, B, and E are clearly within the boundaries of the banks of our river. However, objectives C and D are outside the boundaires of the technological and nontechnological banks respectively.

To select what is perhaps at best a rather unflattering analogy, we might imagine that in our river there is a rather large log that is drifting downstream with the current. On this log there are a large number of ants. Each of the ants occasionally dips a leg into the water and kicks vigorously, thereby gaining the distinct impression that he is responsible for the forward movement of the log. Now it is altogether possible that from time to time there will emerge a sort of "head ant" who sees the value of reaching one or more of the orjectives. With the proper direction and coordination of efforts he can possibly persuade all of the other ants to kick in unison, thereby influencing the course of the log as it proceeds downstream. In this manner he can possibly reach the



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April 8, 1968

24

SP-2989

SP-2989

objectives A, B, or E. But, try as he might, he cannot with the resources at his command reach objectives C or D. His followers simply cannot go beyond the barriers of stream banks. If, for example, after reaching A he decides to try for C, he might find that by the time he recognizes that C is not attainable he has gone so far downstream that he cannot even return to B.

Now, although the analogy is perhaps rather fanciful, it does serve to point out that man, unlike the ant, can assess the relationship between objectives and constraints. When an objective has been determined to be outside the limits of contemporary constraints, then a decision must be made relevant to the choice between abandoning the objective, or broadening the banks of the river, i.e., overcoming the limitations of the constraints by extending the boundaries of the constraints so that the objective falls well within the possibility of attainment.

This view of the relationship between objectives, constraints, and operations implies a very real need for: (1) determining objectives and the relative priorities of multiple objectives; (2) assessing constraints and capabilities; and, (3) evolving operational systems that embody <u>both</u> short and long range programs aimed at <u>both</u> the attainment of objectives and the acquisition of enhanced capabilities. By way of another analogy, it might be pointed out that the acquisition of F-105 aircraft is of little value unless people have also been trained to fly the aircraft and other people trained to maintain it. Further, it might also be observed that the acquisition of the aircraft and

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SP-2989

the personnel is of questionable value unless the facilities have been prepared from which the aircraft can operate. Finally, the whole complex of aircraft, people, and facilities is of something less than optimum value until and unless other people have been acquired who can make optimum decisions relevant to where, when, and against what targets the capability should be employed.

It does appear logical to assume that tangible benefits might be expected to issue from an application of science and technology to the problems associated with law enforcement and the administration of justice. However, it appears equally logical to assume that the acquisition of such benefits can hardly be expected to follow in the absence of at least a minimally scientific approach to the conceptualization and synthesis of the several levels of objectives implicit within the justice context. It is suggested that there is a considerable difference between pursuing an objective relevant to optimizing the maintenance of public order within the constraints of a free society and pursuing an objective of seeking to improve a system for "the administration of justice." In one sense, the latter objective is but one, albeit very important, <u>means</u> as opposed to an end in itself.

If we, as either scientists or practitioners, expect that any real contribution to the attainment of these objectives is to be realized through the use of science and technology, it will be necessary to do more than merely enumerate the objectives in the form of generalizations. The objectives must be translated into statements of specific missions coupled with the subsequent identification of attendant requirements.

SP-2989

If there has been no adequate statement of objectives, missions, and requirements, then there can be no identification, much less relevant assessment, of existing capabilities.

27

Existing capabilities for our purposes here may be viewed as falling into two broad areas--those capabilities already possessed by the governmental agencies concerned with the various substantive areas of law enforcement, and those that have been acquired or developed by entities other than law enforcement agencies.

In this context, then, when we speak of an assessment of existing capabilities with reference to the application of science and technology, we are of course pointing out the necessity for such an assessment in order to differentiate between areas for research and development as opposed to areas for test and evaluation. In the first instance--research and development--a requirement may exist for which no corresponding capability can be found. In the second instance, existing capabilities, developed for other users, may be located and all that is called for is a program of test and evaluation to determine the extent of the compatibility with the constraints implicit in the justice environment. Such a procedure is mandatory if one wishes to avoid a costly program of "reinventing wheels."

Another reason for a vigorous assessment of existing capabilities may be seen in the situation where given applications of science or technology, although well within what might be referred to as "contemporary-states-of-the art," April 7, 19-5 28

SP-2989

are considerably beyond the present human, technical, and/or economic capatilities of some law enforcement agencies. In these instances, the provision of noney and/or the presence of sincerity of purpose alone would be of little avail. These agencies, before they can assimilate--much less use--the new technology, must be "brought up to speed."

In summary then, the application of science and technology to the statement and resolution of problems associated with the civil sector of government--including the administration of justice--offers both promise and challenge.

The promise lies in the possibility of contributing significantly to the achievement and maintenance of a system of justice that reflects and satisfies the changing dimensions of an evolving society.

The challenge lies in making such a system become a reality, but not at the expense of those values and institutions which we wish to perpetuate--in short, to avoid building a system that reflects merely a "triumph of technique over purpose."

The promise cannot be realized, nor can the challenge be successfully met-regardless of the amount of emphasis that may be placed on science and technology--unless at least two prerequisites are first satisfied: (1) a greater degree of synthesis in public policy (objectives) with reference to the administration of justice; and (2) a general enhancement of the full

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spectrum of human and technical capabilities represented by the agencies of government--federal, state and local--that are concerned with the various aspects of the problem that we presently refer to as the "administration of justice."

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Unclassified Security Classification

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