PLAN FOR AN OPERATION RESEARCH STUDY OF ORGANIZED CRIME IN THE UNITED STATES

Technical Memorandun

to

National Crime Commission

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prepared by

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SCOPE OF RECOMMENDED PROGRAM

The objective of the preliminary review just completed by Matson Research Corp. was to plan a research program which will develop and test models (mathematical representations) of organized crime. The review and plan are based on the assumption that organized crime, although it operates under unusual environmental and social constraints, has many of the features of legitimate business and similar organization, operations and marketing problems. The techniques of operations research and management science, which have been applied successfully to legitimate business, can be applied to organized crime. Successful models can develop insight into the interactions between organized crime and society, provide evaluation of the effectiveness of proposed actions, and allow some prediction of the directions that organized crime may follow.

Criminal activity, according to most authorities, is outpacing population growth, and its profits are outstripping the general economic growth. The Kefauver and McClellan hearings have confirmed that crime is an organized undertaking that effectively evades most law-enforcement activities. We are forced to assume that the growth of criminal syndicates is due to intensive application of the management practices that have led to success in the business world. Knowledge and analysis of legitimate enterprise, applied to the study of organized crime, can lead to an understanding of criminal organizations, and perhaps to a prediction of the programs and strategies that they will use in given circumstances.

not valid

We therefore recommend a study of organized crime as a business enterprise subject to a set of peculiar constraints. The criminal enterprise, though not in the established streams of industry and commerce, is by no means without participation incentives; and it is subject to changes in supply and demand, government actions, and the general state of the economy.

The difficulty in finding evidence linking known members of the "syndicate" with crime indicates a level of organization, communication, and control which must rival that of large legitimate enterprises. Knowledge of the structure of the organization and its modes of operation is the key to restricting the growth of organized crime and to reducing its profits. While increased pressure on organized crime may temporarily lead to more violence and other manifestations of disorganization, the long-run advantages to society cannot be overestimated. The purpose of the proposed study is to supply insight (factual and inferential) into the functional, structuring mechanisms, and into the management programs of these illegal groups.

why not ?

The end product of this research program will be a group of models representing several classes of organized crime. These quantitative models will be based on organized knowledge of the structure and operation of the criminal activities and their environment. They will be amenable to mathematical analysis and to tests of the sensitivity of the performance measures to the parameters. The data collected from many sources will be organized in a systematic manner for further use by the National Crime Commission.

By "model" we mean a mathematical representation of the operation or system under study. The model may not be an image of the actual operation in every respect; an analog is sufficient if it can produce realistic results from realistic input information.

The development of models representing all components of organized crime would be a large and difficult task, with so long a time horizon that it could not be undertaken by a single research group. Moreover, crime in the United States appears to be organized nationally only on a "trade association" basis; thus there is little advantage in developing a "national" model of a single type of organized crime. It seems far more meaningful to develop models of regional organization (say, within a metropolitan area) and consider some of the interactions between types of crime in each region. A regional approach would probably be valid even with horse-race gambling, which relies on a national wire service for reporting results, and with narcotics, which depends on an international organization for supplies.

Regional organizations, each handling the same product line, differ in operating procedures and organizational structure. Many of the differences are due to regional environmental conditions, so some effects of environment on operations may be measurable. Phase I of the proposed study is intended to provide sufficient information for the understanding of environment as well as operation and organization. In Phase I the research group will also appraise the various types of crime and select a number of geographical regions for detailed analysis

and model building in Phase II. The selection of regions will depend, in part, on the degree of cooperation that can be provided by local authorities.

Phase II will be devoted to structuring realistic predictive models for analysis in economic and social terms, not with developing detailed strategies for reducing criminal activity. The models, to be useful and capable of general application, must rely on parameters that can be measured directly or indirectly. They must be both realistic and amenable to mathematical or simulation manipulations. In the present state of operations research, reasonably effective models appear to be possible.

The greatest advantage of the proposed models will be to measure the sensitivity of the criminal and police objectives to changes in the value of the parameters. The models, therefore, must allow sensitivity analysis of many parameters. Phase III will include tests of their reasonableness, their range of applicability, and their sensitivity to a number of parameters. Sensitivity analysis is the key to the selection of strategies to counteract criminal organizations and of means to make the environment less hospitable to criminal activities. Phase III must include an experimental design for analysis of sensitivity to the principal parameters.

Phase III will include the development of approved working models of two types of organized criminal activity which have been tested and analyzed in Phase II. In addition, there will be tentative model structures for one or two additional types of crime, a plan for completion of these models, and a description of the interactions between the divisions thus studied.

The sensitivity analysis in Phase III is intended primarily to examine and illustrate the effects of changes in basic parameters. The research group will select variations which might be expected from changes in environment, in law enforcement, in availability of supplies, or in price structure. The results of sensitivity analysis will suggest possible strategies rather than serve as a test for strategies. The final models will have the ability to test alternative strategies and courses of action for both the criminal organization and law-enforcement agencies. The tested and approved models that are developed in this program will be used by the National Crime Commission to examine possible law-enforcement actions and to determine potential strategies for organized crime.

ORGANIZED CRIME IN THE UNITED STATES

Nature of organized crime

Two current generalizations about organized crime in the United States complement each other and form a base for examination of criminal activities. Social scientists state that criminal elements systematically exploit the contradictions between expressed (and codified) social morality and actual social conditions. The second position is held by criminologists, who state that detection and prosecution are difficult because of conflicts of jurisdiction, shortage of talent and resources, political immunity of criminal leaders, inadequate statutes, legal technicalities, fear, corruption, and economic pressure. One might conclude that the social market for illegal "products" remains, while the problems of detection and prosecution are becoming more and more serious.

We should distinguish between types of organized crime; it is unlikely that all types will be capable of analysis and modeling in the same way that normal business has been modeled. Perhaps the best distinction has been suggested by Professor Thomas Schelling of Harvard, who defines all organized crime as either "black market" or "extortion." A black-market criminal activity is based on voluntary participation by some members of society, but it has been declared illegal by legislative action: for example, gambling, narcotics, prostitution, and loan-sharking. Extortion is based on forced participation by members of society: for example, protection, some collusive labor-union control,

and some pinball and vending machine installations. Under organized crime both the black market and extortion operate as monopolies (for the sale of goods or services) and monopsonies (for the purchase of supplies).

Prediction of future behavior is always difficult, particularly when the organization, operating as a monopoly or oligopoly, can apply unpleasant pressure on the interplay of supply and demand. But these conditions are not unique to criminal enterprise: undue pressures are far from unknown in legitimate enterprises, for example the fixed "phase-of-the-moon" bidding for electrical equipment.

Syndicated crime has another advantage besides monopoly: it is neither licensed nor contractually bound to supply a good or a service, and so it can adapt rapidly to changing economic conditions. Crash programs, heavy investment, changes in mode or area of operation can be effected with fewer restrictions and delays than legitimate business encounters.

On the other hand, the criminal organization must reckon with disadvantages. First, since it operates underground, there may be no tactical or strategic decision-makers at the lower levels of the organization. This lack limits freedom of action and slows reaction to change. Second, the underground organization has no "brand image" to provide ready markets in new areas or for new products. Vigor of law enforcement and rapidity of economic change contribute, to a degree unknown without analysis, to instability and insecurity of the environment.

In a less abstract way we can say that organized crime, like any other business enterprise, requires an organizational structure within which authority is defined and communication channels are established. It needs the usual legal, financial, personnel and other staff services of the modern enterprise. It requires an accounting and auditing branch to assure the proper flow of goods and services, and to prevent pilferage, theft, and the withholding of funds. It must recruit staff to perform essential operations. In principle, organized crime has basic structure and organizational needs which are no different from those of legitimate organizations.

The constraints on criminal enterprise subject their managers to hardships not common in normal businesses, limit the structure of the organization, and retard the growth of "business." In spite of such restrictions, organized crime thrives, with an internal growth rate greater than that of the economy in general. Crime has expanded into many outwardly legitimate areas, using the profits of the various operating divisions. As time passes it will become more and more difficult to distinguish the legitimate outposts or "front" enterprises of organized crime from normal business organizations. By "legitimate outpost" we mean an enterprise engaging in normal commercial activities and also serving as a depot, depository, or distribution center for organized criminal money and activity. There are indications that some banks, importing companies, vending machine companies, and trucking companies are such outposts now.

The environment

A business organization exists within an environment which varies with the passage of time. The environment consists of the general economic structure, the institutional constraints (for example, taxation, licensing, and the degree of regulation), the state of the market, the available labor pool, and other factors. Organizations may operate within the given environment, or they may attempt to change the environment through the use of promotional, economic, and legislative activities. Success and profitability depend, in large part, upon the matching of operations to environmental conditions.

For an enterprise that operates mainly outside the law, the external environment is of even greater importance. Promotion, one of the standard forms for influencing the environment, is not available, at least not openly. There are additional advantages, of course, which the illegal operator maintains. He can use fear and violence as an instrument for changing the environment; he is also less subject to certain institutional constraints such as tax laws and regulatory bodies.

The environment influences the method, the operation, indeed the existence, of criminal activity. Loan-sharking is almost unknown on West Coast docks but thrives on the New York docks, perhaps because of differences in structure and management of the labor unions. Similarly, in some cities (or at least in some industries in the city, like the New York garment center) "protection" thrives, while in other cities there is no organized protection industry.

Organized crime, through campaign contributions, control of political organizations, and bribery of elected and appointed officials, has persistently utilized political means of affecting its environment (either action or inaction). This technique may also be used by legitimate organizations acting criminally. Leaders of criminal organizations have high status in some urban and state political organizations. The effects of such corruption are shown when licensing and enforcement officials condone organized crime, invoke light sanctions against members of criminal syndicates, block desirable legislation, or withhold funds for more effective law enforcement. In certain areas these actions, coupled with fear and violence, have created a monopoly position for organized criminal activity.

There is also bribery and corruption of police, licensing authorities, and other officials at the lower levels, as well as bribery of telephone employees and staff of other pseudo-public agencies. This low-level corruption is essential for the marketing of some services, such as gambling and prostitution. Such corruption is perhaps more sinister in that it undermines respect for, and cooperation with, law-enforcement agencies and contributes to the further expansion of both organized and unorganized crime. Since most urban and state law-enforcement agencies have no "Inspector General" or other form of full-time internal control, corruption and malfeasance go undetected for long periods of time. Corruption of public officials at all levels is an objective as well as a tool of organized crime.

Organized crime recognizes the importance of the environment and the sensitivity of its profits to external conditions. The self-policing and restraint shown in recent years is probably due to the desire to maintain anonymity and to keep unsavory activities out of the public eye. To some extent this policy has succeeded, as witnessed by the lack of general interest in the resources available to law-enforcement agencies. Another indication of self-policing is the strong participation by members of organized crime in publicized charity drives. The present political and social environment is not particularly hostile to organized crime.

Stable working procedures are possible only in a stable environment. Obviously a stable environment will permit an enterprise to operate efficiently with less than current and less than accurate information. The price of error in these conditions is nominal. The criminal organization would be far less effective than it now appears if instability were introduced in its markets or by the institutions with which it must interact.

Organization

Because the criminal enterprise generally operates within a more severe environment than does the legitimate business, its members are compelled to develop and maintain a sound, efficient organization. Such an organization must exist, since only a portion of their illegal activities is detected. This success appears to be partly due to a superior intelligence system, made effective through a broad informal network that supplies the senior officers with timely, reliable data.

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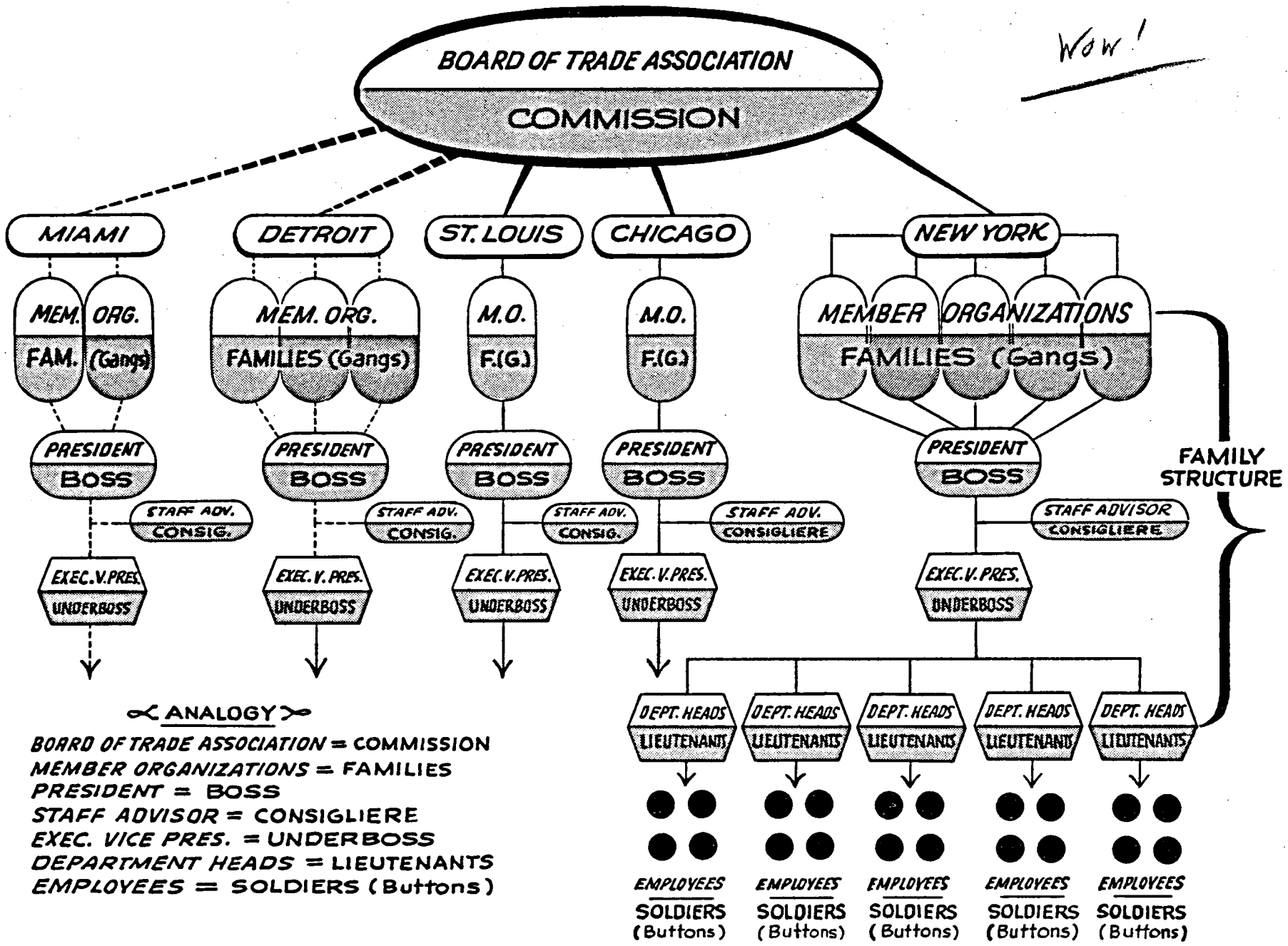
The Syndicate, or organized crime, as we know it today is a grouping of loosely structured but rigidly controlled gangs or "families." The drawing on the next page, based on testimony given by Joseph Valachi to the Senate Committee on Organized Crime and Illicit Traffic in Narcotics, depicts our present understanding of organized crime.

At first glance, the criminal organization appears to operate in a decentralized manner. This appearance is misleading. Bits of information gained through experience depict an organization rigidly centralized at the lower level, with a heavy emphasis upon control through physical violence. Business organizations have learned that the decentralized form is able to react more quickly to altered conditions than the centralized form, provided there is a cadre of organization members motivated to program possible responses and select the one most likely to succeed. The organization must report its activities for purposes of coordination between operating divisions, so good communication channels are required.

Business organizations have also learned that the centralized organization form, though ponderous, can quickly react or adapt to altered environmental conditions by developing a large repertoire of stand-by programs designed to match various experienced (or preconceived) environmental conditions. A centralized organization must have an excellent information network through which it can determine the environmental states, select the appropriate program, and inform its agents. These stand-by programs are not only designed, but also selected for use, at the top of the structure. Criminal management may

ORGANIZED CRIME IN THE UNITED STATES



ANALOGY

BOARD OF TRADE ASSOCIATION = COMMISSION
MEMBER ORGANIZATIONS = FAMILIES
PRESIDENT = BOSS
STAFF ADVISOR = CONSIGLIERE
EXEC. VICE PRES. = UNDERBOSS
DEPARTMENT HEADS = LIEUTENANTS
EMPLOYEES = SOLDIERS (Buttons)

never have been required to adapt to an environment of rapid change, and so may never have needed a large repertoire of stand-by programs.

Organized crime, like some strong family-controlled businesses, has as a major objective maintenance of the existing management as well as maintenance of the organization itself. The management wishes not only to perpetuate itself but also to avoid detection and prosecution. It creates organizational structures to this purpose. We should seek the weakness inherent in such structures so that proper legislative or law-enforcement action can be taken.

Management and control

Crime is meant to pay, and its administration and control must be in terms of units of exchange -- dollars. Therefore, strong financial control is necessary. Financial management must control not only the flow of cash but also the channelling of funds into depositories, legal and illegal, or into reinvestment in new criminal enterprises. These flows within an organization are normally difficult to follow. Yet, as the funds flow into new ventures or across division lines, and as the size of such flows increases, they become more visible from the outside.

Organized crime's need to conceal its transactions from tax officials and law-enforcement officials results in large flows of cash, probably through some independent "quasi-bank" or cooperating legitimate financial organizations. Examination of means of moving cash and other negotiable funds is required to define the characteristics of financial

organizations owned by or cooperating with organized crime. These flows and the institutions involved in them develop characteristics and patterns of operation which should be amenable to analysis and description. Financial interactions are essential to the criminal enterprise; they are the only way to exchange illegal gains for the goods and services that the underworld, as well as the population at large, desires.

The criminal organization has a second, equally important, form of control -- control meant to prevent detection. Security from detection has a financial as well as a physical aspect. Conviction records and court decisions indicate that legal agencies have been most successful in securing convictions through the use of financial data, or conversely through the complete absence of financial data, which in itself is evidence. Therefore, the criminal organization, even though it does not keep conventional records, must concern itself with accounting form and content. In some forms of extortion, the "customer" must have at least a dummy entity which receives payment for the criminal organization; otherwise, routine examination of the customer's financial records may lead to detection of the criminals.

Marketing

Much is known of the products and services sold and distributed by organized criminal organizations; less is known about the marketing of these services, particularly wholesaling. The markets of the criminal organization, like those of legitimate enterprise, are affected by geographical changes in population, by the increasing affluence of society,

and by changes in the aspirations of potential customers. The criminal marketing organization and the methods of marketing and distribution are worthy of detailed study, because they are visible and vulnerable at the points of exchange and because, once analysis has revealed the criminal marketing policies, action can be taken in advance of changes by the criminal organization.

The criminal organization is undoubtedly changing its marketing activities as the demand for services changes, owing to economic and social developments in urban areas. As deprived parts of the population raise their standards and aspirations, they become poor markets for some illegal products and services; they may become good markets for others. Another change in the market is that higher-income groups are seeking some criminal products, which may therefore be "retailored" for consumption by these groups. Any increase in narcotic consumption of college students represents a change in the socio-economic characteristics of the market. So does organized prostitution if it aspires to call-girl operations. Any severe restriction of bank credit may force small businessmen to borrow from loan sharks; expansion of credit reduces loan-shark operations.

Markets for organized crime are also influenced by technological developments. Unscrupulous use of bugging equipment and other electronic devices expands the market for protection and extortion. Organized crime is alert to these new marketing possibilities, and will continue to assess new technological devices for its profit-oriented ends.

Recruitment

The organization may prefer to recruit from the families of its managers and employees, but they are an uncertain source of competent manpower. Organized crime, like other enterprises, recruits young men of talent and educates and trains them for management. For purposes of analysis we assume that the enterprise will not decay after the demise of the present leaders; as in legitimate business, perpetuation of the organization is as important an objective as any other. Leadership must be maintained at a high level and essential posts must be filled.

Recruitment is another zone of vulnerability where the organization interacts with society. Increasing affluence and the provision of legitimate employment opportunities reduces the desirability of organized crime as a profession. The traditional recruiting areas, at least for whites, are slowly disappearing, and the hero-image of the criminal manager can be nullified by public reaction. Perhaps the best hopes for criminal recruitment lie in the quasi-legal outposts of the organization.

Fear has been used to aid in recruiting, but it can only attract recruits for the lower echelons. Moreover, any large-scale use of fear will attract attention from law-enforcement agencies. In the short term, reducing the recruitment of lower-echelon employees will hamper the organization's operations. In the long term, if coupled with vigorous apprehension, it will destroy the organization. Studies by the Crime Commission show that only a few "professional criminals" are inducted into syndicate activities at the senior levels; in general, these

"professionals" lack management skills. Given the obstacles to recruitment of good managers, it is amazing that organized crime has performed so well.

Not really! I have when you have a Soviet enforced monopoly

APPROACH

Three distinct phases are necessary to achieve the objectives of the research program. Each phase builds upon the previous findings. At times there will be parallel effort in two phases, but the basic flow of research will follow the sequence given here.

Phase I

The research program must begin with a study of the mechanics of operation of the individual "divisions" of organized crime (for example, policy, prostitution, narcotics) from the point of public contact up to "division management." This study of operating procedures will be followed by an analysis of available statistics to obtain measures of the magnitude of sales, extent of markets, and number of employees. A study of procedures is essential to understand the organizational structure and functions. Knowing the modes of operation, one can reduce the model to the simplest form compatible with reality. (By analogy, in the design of management information systems, one starts by analyzing the essential operations; when these operations are understood, one develops the communication structure required for management information.) The statistical study will complement the study of mechanics, and make it possible to plan detailed analysis to the greatest advantage.

The study of procedures should include the communication and control network, the flow of monies from the consumer to the ultimate depository, and the flow of management responsibility and authority within the

organization. Material will be available from law-enforcement agencies, but some data will be difficult or impossible to obtain. It may be necessary, therefore, to make rational assumptions to complete the data-collection phase of the study. When such data voids exist and assumptions become necessary, the research team will review the reasonableness of these assumptions with a number of law-enforcement officials.

The principal sources of data for Phase I will be federal, state or local law-enforcement agencies. Data may also be obtained from other sources, such as Congressional hearings, tax reports, and records of regulating and licensing bodies.

The study of mechanics and modes of operation will require the cooperation of law-enforcement agencies. Much of the basic data exist in scattered sources. Operating procedures, at least at the lower levels, differ by region and perhaps by urban area. The study of procedures should distinguish between operations that are "subsidiaries," "franchises," "agencies," or independent operations, and should consider the type and extent of the products merchandised. Operating procedures may change with time, indicating either internal improvement or trends in external factors, that is, alterations of legal and political institutions. Procedures and product line change under external pressure from society. These changes may indicate the degree of centralization within the enterprise, the methods of recruitment and compensation, and the sensitivity of the enterprise to economic and political factors. Modes of change in the enterprise may provide more information on the

mechanics of operations and the structure of the organization than could be obtained by analysis of a stable situation.

Historical data on the growth and development of individual criminal enterprises will be of value, but one can no longer take all historical evidence as directly applicable. Changes in the economy, shifts of population, and altered values of different income groups have probably had a significant effect on criminal operations. Changes in tax laws, particularly the reporting now required by the Internal Revenue Service, have changed the methods of financial operation and the role of the organization's financial "trustees" and fronts. Changes in banking regulations have also had some effect on the conversion of monies by organized crime. Marketing opportunities and altered needs of organization bosses have probably directed recent growth into legitimate business areas.

Phase II

The second phase of the study is model-building and evaluation. Given the mode or modes and magnitude of operation, one can attempt to develop mathematical and descriptive models of the operation and its management by substituting inferred rational actions or reasonable relationships for missing data.

There are several factors in the organization itself (characteristics of organization members, style of leadership, motivations for participation of members) which appear to dictate two primary ways of

operation for organized crime: as a grouping of autonomous operating cells, each oriented toward the achievement of specific goals, or as a rigidly structured hierarchy with tight control procedures. In either case, it is probable that operations are performed in a highly programmed manner at the point of execution. This programming fulfills the dual purpose of control and coordination. Phase I research is intended to identify these programs or operating procedures and the circumstances under which they are utilized. The greater the intensiveness of programming of operations, the greater the chances of modeling them.

We cannot at this time define the precise form that models representing organized crime may take, or the exact nature of the interactions between crime and society. Some analytic models of criminal/law enforcement situations have been reported in the literature. These generally deal with criminal activities which are not organized and have a form of competitive game structure. A typical example of this approach is the paper "A police conflict model" by M. Fry, presented at the fourth conference of the International Federation of Operations Research Societies in Boston, September 1966. The author examines the stability of general crime as a function of the level of police activity and the lags in reaction to crime (for example, delays in increasing police budgets). Solution of the differential equations that describe the conflict indicate that there are crime cycles whose duration depends on apprehension rates and the level of police activity. Unfortunately the model omits recidivism and assumes a constant rate of new recruits, independent of the level of police activity.

A more interesting model was developed by J. M. Danskin ("Letter to the editor," Operations Research, Vol. 10, 1962, pp. 907-909) as an outgrowth of military search problems. Danskin considered the problem of optimal strategies for bookies when they are subject to police raids and have the option of bribing police officers, using a fixed amount of cash, to divert the raids with some probability that the bribe will be effective. The model includes only interactions between police and the bookies in a steady state or equilibrium situation; revenue is a function of the number of unapprehended agents only. In this case, if the bookies act optimally, in closing unprofitable locations and in distributing bribes, then for any intensity of upper-level police activity the number of arrests is constant independent of the detailed strategy used by the police. In this model the decision parameters are the number and distribution of bribes for the bookies and the intensity of activity by the police.

In a more extended model the interactions between the bookie and the customer would have to be included. One approach to this revenue-producing interaction is to consider the number of bettors n_i as a function of intensity of police activity p_i (the higher the intensity the smaller the number of bettors); the frequency of bets f_i as a function of the ease of placing bets b_i (the number of bookie's agents and the method of placing a bet); and the bet size d_i as a function of the general economic situation. In this case the revenue would be proportional to $n_i f_i d_i$ and would be a function of the parameters p_i and b_i in the bookie-police interaction model.

To represent bookie-police interaction, Danskin's model should be changed to allow the size of bribe to reflect the intensity of police activity, and the expectation of apprehension should depend on both the intensity of police activity and the ease of placing bets. Upper-level police strategy is then defined by the intensity factor and the size of the force assigned to an area. The bookies' strategy is defined by the ease of placing a bet and the bribes offered.

The effects of organized crime can be included in such a model by considering all i bookies as following a directed policy and by allowing the organization some method of influencing the intensity factor and the police force assignments.

Both Danskin's model and the extensions described above have defined a static situation. In fact the problem is dynamic; intensity and betting ease change with time and reflect the immediate past. We can therefore examine a model structure in which the policy and strategy parameters in period t depend on actions in previous periods, and even include delay factors of duration Δt for changing some parameters (for example, police intensity cannot increase by more than some maximum amount in a single period). Such reaction times are probably necessary for changes in bookie and organization strategies. By this extension we may also be able to consider statistical effects rather than the purely deterministic interactions described thus far.

The models just described are analytic. The final model, even if analytic, will in all likelihood be somewhat different. For example,

we have not so far considered the effects of legislative or judicial action. A higher penalty for apprehension of low-echelon organization staff may serve as a deterrent to recruiting as well as impose a higher cost on criminal operations. The models described above basically assume only apprehension of low-level employees; they offer no way of evaluating the effects of apprehending senior members of the organization, or of measuring the senior members' insulation.

Other model forms for this type of organized crime are possible. There has been some preliminary work in considering the bookie-police interaction in terms of game theory. This approach encounters conceptual and practical difficulties: the game is not necessarily zero-sum; and it omits the effect of police and public action on the bettor-bookie interaction. Nevertheless, further investigation would be worthwhile to see if the method is applicable to particular segments of the problem.

Simulation may be a more fruitful tool than analytic modeling for the study of organized gambling. It accommodates statistical variations and dynamic characteristics which might make analytic models interactable. In such a simulation model, bettors would be drawn from a population whose characteristics change with the state of the bookie-police system at a previous time. The bookies' operational characteristics (the ease of betting or a related parameter) would change to reflect the state of the market and the level of external pressure. Simulation requires an experimental design capable of distinguishing between effects of changes in parameter and random fluctuations in the system.

Some combination of analytic and simulation models is also a possible candidate for a final model. Those segments which can be treated analytically can be included in a larger-scale simulation. The research group should have the technical ability and the intellectual flexibility to examine promising alternatives for model design.

The model for narcotics will have features in common with the gambling model, but the final model will not be identical. The narcotics model, for example, should include a submodel for supply operations. It will also have a different "revenue" submodel, not only because both the addict and the pusher commit illegal acts, but also because the market interaction in narcotics depends on the supply available.

The prostitution and loan-sharking models will also have some features in common with the gambling model. For prostitution, where the ratio of captures to agents is small, tighter controls are required. For loan-sharking, the "revenue" submodel will be somewhat different from the one for gambling; it should include interest growth, for example, and it may have to consider a different form of revenue generation for large loans.

Phase III

In the third phase of the study the parameters established in model-building will be tested by varying the values to represent different conditions -- for example, geographical changes in population distribution, reduced success in bribery attempts, new legislation, or changes in supply. The results will be compared with known situations. These

tests will be followed by a series of experiments to measure the sensitivity of the performance measures to changes in the values of the parameters.

Sensitivity analysis is an essential element of mathematical modeling. It sharpens insight into the complex relations between the parameters, serves as a critical evaluation of the model structure, and allows the identification of the parameters which contribute most to control or stability. If the initial values of the parameters are not known with sufficient accuracy, sensitivity analysis shows which parameters are adequate and which require further computation. It can also lead to a determination of the valid range of parameter values and, at times, to a simplification of the model.

In application, sensitivity analysis aids in the selection of action alternatives. If the law-enforcement performance measure is relatively insensitive to the size of the force assigned to an area but is sensitive to, say, the size of the bookies' switchboard, then efforts should be directed to means of detecting telephone betting centers. Phase III should be directed to the analysis of the parameters and their interactions, not to the selection of strategies. It should be possible to develop relations between the parameters and levels of activity in the real world.

Sensitivity analysis is not restricted to static situations. It can also be used to measure the effects of parameter values on measures of stability. A stable environment is perhaps more favorable to organized crime than to law enforcement. Environmental stability may

be responsible for the success of senior criminal officers in insulating themselves from other divisional activity and from the actual illegal acts.

The greater the opportunity for variability in the organization members, in the program for the crime, or in enforcement practices, then the greater is the burden for coordination and successful execution of crime. Thus, because of the strong motive for insulation, one would expect the models to show organized crime trying to stabilize its environment. It would do this by bribery and other influences on the environment, by fear to control its own members, by economic pressures and fear to control its markets.

On the other hand, refinement of the models through sensitivity analysis may show that the organization's control mechanisms are not noticeably related to the organizational hierarchy. Criminal bribery records and other control mechanisms are highly invisible. Perhaps, however, the structure of control can be inferred from other identifiable variables in the operating organization. Organization theory separates the procedures of control from the planning or innovative process. The research program will try to identify the sources and points of procedural control so as to make certain criminal actions more apparent.

The study of the criminal organization is thus meant to go beyond the apparent structure, beyond the apparent decision rules that invoke one program or another depending upon the situation, to the methods of

devising and revising programs to be employed as markets, enforcement activities, and membership change. The models may only be symbolic quantitative analogs of the real world. What is important is not the form of the models, but their ability to imitate and predict criminal actions and performance.

We cannot now make any definite statement of the form that the models will take or how all of the factors will be included. It may be difficult to include in formalized models the interactions between operating divisions of organized crime and interactions between similar organizations in different regions. Such interactions are of secondary importance for the analysis; they may only take place in financial transfers, in recruiting, and in any risk protection, by bribery or otherwise, at the higher levels of criminal management.

The approach suggested appears to be more applicable to black-market crimes; considerable revision would be necessary for extortion crimes. Certainly, there is a difference between the market structure of gambling, where the customer seeks out the syndicate agent, and that of protection, where the agent creates the customer. The extensive revisions necessary to apply the model to crimes of extortion can be made in a later research program. Although we take as given those legislative acts which outlaw syndicate gambling, sales of narcotics, and other black-market "services," we expect to test the effect on the profits of the organization of full and partial removal of these statutes. There is precedent in other countries for such action.