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## Book Review of "Crime and Information Theory"

Klaus Krippendorff

University of Pennsylvania, klaus.krippendorff@asc.upenn.edu

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## Book Review of "Crime and Information Theory"

### Disciplines

Communication | Social and Behavioral Sciences

### Comments

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## Book Review

M.A.P. Willmer, Crime and Information Theory, Edinburgh and Chicago: Edinburgh University Press and Aldine Publishing Company, 1970.

For the communication researcher, Crime and Information Theory should provide interesting reading. It exemplifies a broadening of the scope of application both of the communication paradigm and quantitative theory. Let me discuss these two aspects separately.

As I see it, the communication paradigm essentially requires the researcher (a) to view his objects of analysis in their role as senders and receivers; (b) to study the exchange of information between them in the expectation that it enables him (c) to discover the dynamic consequences of this relation. In Crime and Information Theory, the principal senders and receivers are the criminal and the police respectively. Witnesses, the public, etc. play a mediating role.

In his second chapter, the author points to the importance of information as a precondition to solving crimes. Information must be available to determine whether a crime has been committed, information is required to delineate the population of possible suspects, and information is needed to convict the criminal. The police thus becomes a processor of the information supplied by victims, witnesses and the public. One of its tasks is to differentiate valuable and irrelevant clues which poses the problem of coping with what communication researchers call noise.

Clearly, if a criminal could conceal his behavior completely, he could consider himself free to do whatever he pleases. However, when he identifies opportunities for illegal gains, when he prepares himself

for the act, when he executes his plans, and when he enjoys the fruits of his machinations he may leave behind evidence in the form of physical traces, he may exhibit changes in overt behavior, or he may talk to potential informers. These are the signals which the criminal emits and which the police tries to detect. The various kinds of signals and their relative strengths are discussed in Chapter Three.

Chapter Four is correctly titled "A Battle over Information" because, consistent with the communication paradigm, the criminal's strategy will be one of minimizing the strength of the signal emitted while the police's strategy aims at amplifying the relevant signals it receives. Either behavior is associated with costs and gains which leads the author to a kind of game theory representation of the situation. For example, a thief may have the option of selling his goods for a high profit to a reputable dealer with a high probability of being suspected of the crime, photographed or reported to the police, or he may offer them for a marginal profit to a shady character, emitting, in the author's terms, a weak signal with a low probability of being detected. Naturally, the risks that criminals are willing to take determine also the police's choice of search strategies.

"Deterrence and Prevention" are discussed in the fifth chapter. This chapter goes beyond the simple sender=criminal--receiver=police relationship because it concerns itself with the effects of knowledge among criminals about each other and about police behavior. For example, when a crime is committed by a team, both payoff and signal strength are likely to be greater than for criminals working in isolation. When such groups are formed, rational criminals presumably bargain for their roles by

considering how much each increases the payoff without significantly increasing the strength of the signal jointly emitted. The author argues that various means for amplifying the strength of signals may help in deterring large-scale crime. Other recommendations refer to situations of part conflict -- part cooperation between criminal and police, such as the police's involvement in rackets, and between criminal and victim, such as in the situation of blackmail. Either situation is likely to absorb the information that could be made available to the legal authorities. The deterrent effect would be, presumably, achieved by incentives to break the information blockage.

The last chapter is quite unrelated to the preceding five, in that it presents an interpretation of available crime statistics.

To present the quantitative part of Crime and Information Theory the author chooses to let "mathematical notes" follow the verbal elaboration of quantitative concepts. The reader not interested in this mode of thinking can skip them. He will not lose the thread of the argument but may not see the implications of the approach. Conversely, for the mathematically-minded reader, the notes are self contained and merely omit references to the author's motivations and examples.

The basic ideas are not new. For the police there is an initially large population of possible suspects. A received signal, say, indicating that the suspect was male, Caucasian and 6 feet tall, cuts the size of this initial population down to a smaller number. The difference between the logarithm of the initial number of suspects and the logarithm of the remaining number of suspects is a measure of the information value of the signal or of its strength.

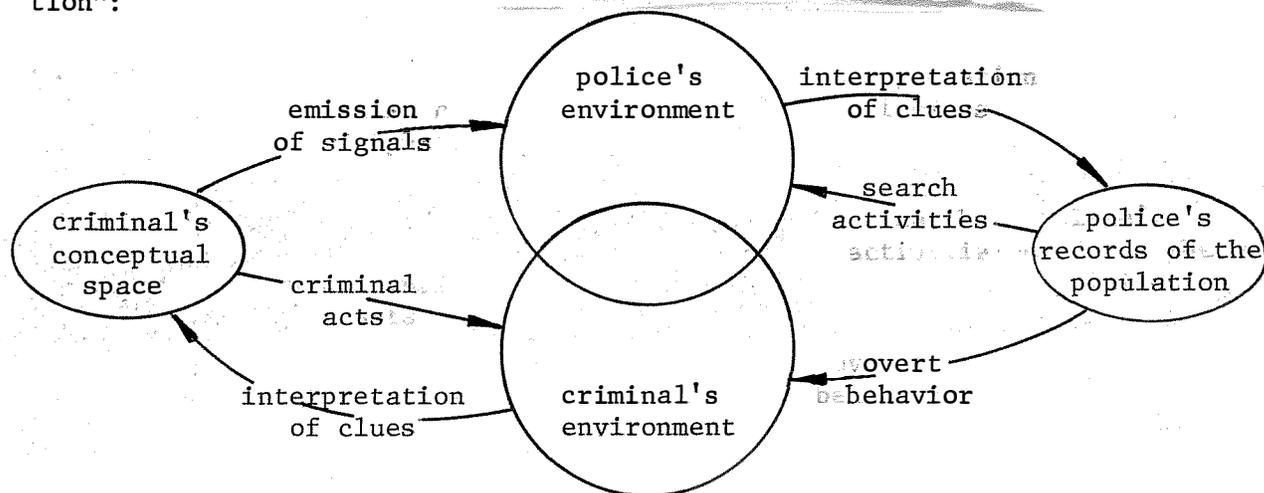
Obviously, some informers are reliable while others may not be so regarded; some signals are interpreted correctly while others may lead to wrong conclusions. The author considers these possibilities by assigning probabilities to the partition of the suspect population which a received signal invokes. Here then the author deviates from Shannon's Mathematical Theory of Communication. While in Shannon probabilities have frequency interpretations, in the book under review they are regarded as subjective and as resulting from induction.

The remaining mathematical approach is an elaboration of game theory and bargaining theory. For example, the known payoffs of the combinations of the police's strategies with the criminal's behavioral alternatives permit the conflict over information to be treated as a game. And when the options of two criminals who bargain for roles in a planned crime are presented in a payoff/signal strength space, the joint maximum can be identified as the criminal's rational meeting-point which the police will have to face.

Let me now discuss some of the shortcomings. As far as the application of the communication paradigm is concerned, the book is quite imaginative and on the whole successful, though, from the point of view of an external observer, it is biased in favor of the police. This is not just a consequence of the fact that the research was undertaken while the author was a member of the Police Research and Planning Branch of Britain's Home Office; it is presumably because the police -- unlike the criminal -- has a convenient unit of enumeration: the number of possible suspects in its records.

The author considers all signals as mapped into a property space of possible subjects without discussing how this mapping comes about. What is omitted here is precisely what would help to make the police a more efficient processor of information. The quantity of information as measured by the author may provide a criterion for the police's success but does not provide insights into the process.

When one tries to do justice to the two principal communicators, one has to consider at least the following information processes, of which the author discusses only the "emission of signals" by the criminal and their selective effects of the "police's records of the population":



For example, much of the police's effort consists of selective "search activity" with the possibility of "evidence" being created rather than discovered. There can also be no doubt that the police's "overt behavior" provides signals of various strengths to the criminal who in turn may be involved in the "interpretation of clues," etc. These possibilities are omitted in the book, perhaps because the communication paradigm is applied too narrowly.

For an appropriate information theory of criminal detection, the real difficulty lies in the conceptualization of the police's environment, i.e., the space representing all possible clues and their interrelations which the police might consider relevant for interpretation. This would be a prerequisite for studying how this space is interpreted into selections among possible suspects. Similarly, to understand the criminal's behavior, the interpretation of the criminal's environment and consequent reactions must be described. The author does not consider such problems.

The mathematical notes, particularly concerning the basic measures of information, seem straightforward. But a major weakness is their meaning. Clearly, when the population of possible suspects is large, more uncertainty regarding the criminal prevails and more search effort is needed than when that population is small. Now, when a signal suggests an uneven distribution of inductive probabilities over the set of suspects, the author correctly argues that information is received. However, the consequent search effort need not be less than before the signal was received. Even the simplest Sherlock Holmes story teaches us that an individual who appears to have a low probability of involvement on logical grounds may often be precisely the one who is sought. Thus the reduction of the search effort is related to the quantity of received information only when the implied evidence is unshakably conclusive.

A similar point may be made with regard to contradictory information. The police is always confronted with this possibility, but the author's information theory is not equipped to handle it. This is

particularly the case with meta-information, e.g., information about the reliability of an assertion or of the reliability of an informant.

In addition, when discussing the battle over information, the author seems to use game theory rather uncritically. For example, the police with its potentially large supply of officers would probably be most successful if it could avoid making choices among strategies and follow all of them simultaneously. Considering that such a situation could not any more be considered a game, generally, the police would presumably want to avoid engaging in a situation that is game-like.

Assuming that both criminal and police confront each other in a game-like situation, the successful application of game theory is made difficult by two further peculiarities of the situation. First, it is very unlikely that such games are zero-sum games for which solutions are known; i.e., it is very unlikely that the police gains what the criminal loses and vice versa. The currencies of both players are generally quite different. Second, the author's verbal concern for the information transmitted from the criminal to the police is suddenly completely omitted in the formalization of the situation as a game. Players now seem to be required to make choices independently of each other. This discards the author's main contribution.

In conclusion, the application of the communication paradigm to a relatively unusual domain makes Crime and Information Theory worth reading. The reader should know, though, that the book deals primarily with the police's side of the story and of that only with the product of its search and information processing activity, not with crime and criminals. The quantitative theory contains interesting ideas that

are in need of further development, but their practical import is unclear. The use of game theory for such situations presupposes more work.

Klaus Krippendorff  
Associate Professor of Communications  
The Annenberg School of Communications  
University of Pennsylvania