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December 1998

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Recommended Citation

Agrawal, Manish; Rao, Raghav; and Sanders, G. Lawrence, "Design and Implementation of Distributed Databases for Improving Law Enforcement in Developing Countries" (1998). *AMCIS 1998 Proceedings*. 139.

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Design and Implementation of Distributed Databases for Improving Law Enforcement in Developing Countries

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Huge populations and low per capita incomes are the norm in developing countries. Apart from the other impacts, these two features make law enforcement in developing countries a colossal task. The absence of databases on citizens - their credit histories and felony records, is a serious impediment to normal Government activity and regulation. This lack of control can have serious consequences, domestic and international, if not checked immediately. In this paper, we propose that the rapid advance in telecommunications and computer technologies could be used very effectively in creating infrastructures in developing countries to improve the enforcement of law and order.

Developing vs. Developed: The Indian Scenario

As an example for the situation in developing countries, consider the statistics for income and population levels of India and the U.S. (see Table 1).

Table 1

Statistic(mid 1994)	India	U.S.
Area ('000 km ²)	3,287	9,809
Population(Million.)	899.9	260.6
GNP per capita (US \$)	320	25,880

The population density in India is more than 10 times that of the U.S. whereas the GNP per capita is 80 times less. In absolute numbers, the population in India is more than 3 times that of the U.S.. The implication of these numbers on law enforcement is that whereas the factors contributing to crime remain about the same in both countries, the availability of resources to check crime in India is less by orders of magnitude. The impact of this lack of resources is felt at every stage in the law enforcement process. There are fewer vehicles to patrol city streets, greater delay in police response to crime reports, inadequate resources for

scientific investigation and inadequate number of courtrooms for trial of cases, resulting in delayed trials of poorly investigated cases. This reduces the trust of the people in the judicial process.

Background

The administrative system in India is largely an extension of the system established by the British before 1950 and the information system in use today is therefore the system created more than fifty years back to meet the requirements of a different age using the technologies available in that age. At that time, the transportation systems in India were not suitable for moving long distances and people lived and died in the neighborhoods in which they were born. Accordingly, the administration and the information system were organized by "Blocks". Blocks were usually demarcated by geographical features like streams etc. and consisted of a population of about 40,000 people each. Records were maintained on paper and there were well-defined procedures to maintain records. Clerks who maintained the records worked in the same office for over 30 years and their personal memory is an integral component of the information system which has been in use all these years.

However in the 90s, with improvements in the transportation system and private enterprise, people have begun to look for work opportunities without regard for geographical boundaries, moving thousands of miles if necessary. Clearly, an information system created for geographically confined populations is inadequate for such a mobile population. A short distance from home, a youth may enter an environment in which he is completely unknown and effectively anonymous. A modern information system should take this factor into account.

Trust and Control

Trust may be defined as "the confidence that an organization will behave according to expectations and that it will exhibit goodwill" [1]. Trust is necessary to reduce complexity in social systems. Law enforcement agencies, like other organizations which wield authority, count on the trust of the individuals they lead to be effective in their operations. There must be trust in their authority, a willing grant of power in the expectation that they will use it with technical competence and with fiduciary responsibility for the society as a whole [3]. The granting of trust thus makes powerful social control possible. It may therefore be expected that technologies that strengthen the public trust in law enforcing agencies would have a positive impact on the performance of these agencies.

Law enforcing agencies on their part, exercise direct control on the activities of the people. This control can take many forms starting from tickets for traffic violations to arrests for crimes. These agencies believe that increased levels of control lead to

better regard for the law resulting in reduced rates of crime. According to this argument, technologies that increase the level of control exercised by the police agencies over the public could lead to improved performance by these agencies.

The public trust in the police and the control of the police on the people are therefore related but mutually orthogonal dimensions in the law enforcement process. Information technologies can clearly impact both dimensions, the levels of public trust – through quicker information sharing, transparency in information processing, response speed, execution of warrants etc. and the levels of police control - through better monitoring of commercial and other transactions, execution of warrants, monitoring activities of political parties and unions etc.. However, in a modern society, technology solutions that bring out the same performance from law enforcing agencies by building mutual trust would be clearly desirable over solutions that achieve the same result by increasing the level of control by the police. Utilization of information technology can enable the design of law-enforcement processes in such a manner that the performance of law-enforcing agencies is improved on the basis of raised levels of public trust on these agencies. By opening up new channels of communication between the public and the agencies, these models could generate the same performance from the police as more totalitarian models. In this paper, we focus on one specific aspect of Information systems, the databases that can have an immediate impact on law enforcement.

Distributed Databases

Traditional information systems have generally been based on centralized databases. However, many features of distributed databases make them suitable for the design of databases for nation-wide law enforcement systems. Among these are the location of data near the "maximum demand" site, faster data access and processing, local site autonomy, greater immunity from a single-site failure and an informative user interface that can be used even by less educated users with simple training.

The increase in the computing power of stand-alone PCs has made client-server systems the preferred architecture in modern implementations of distributed databases[4]. They place all presentation and application software on the client as well as the data required for the most frequent local transactions. Other data is retrieved from the server when necessary.

This design fits with the existing administrative structures of law enforcement agencies which are organized by geographical regions. Each unit has data on the criminals inhabiting the area and most searches are terminated within its jurisdiction. For other searches, requests can be broadcast to the other machines.

Framework

We propose here a framework for the trust-control balance in a society and it's relationship with institutional databases in the law enforcing agencies. The relationship is shown in Figure 1:

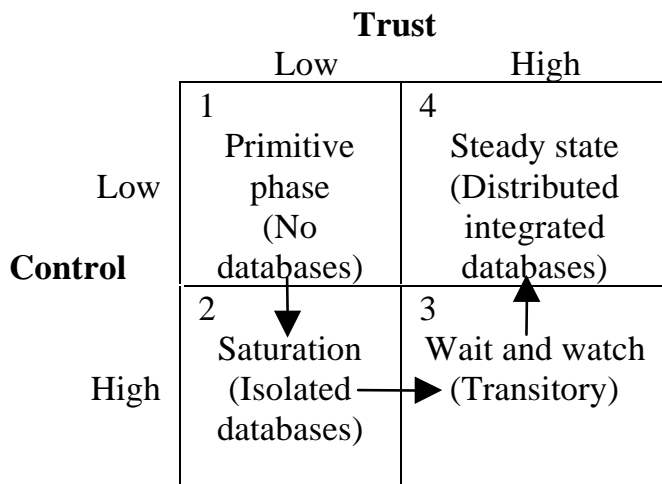


Figure 1

1. In the rudimentary stage, a society starts without any organized law-enforcement machinery. There is no organization of information about the inhabitants or their antecedents and trust and control are not institutionalized in the society. Any information about individuals is informal and we may depict this as a society with little information about its people. This situation is depicted by cell .

2. The organization of government introduces ideas of trust and control in the society. The government is expected to provide a safe environment so that the citizens can focus on carrying out their normal business activities. This leads to the establishment of various agencies to look after different aspects of law-enforcement, each creating its own information systems and databases. Laws are created and norms of acceptable behavior are defined. This increases the controls on the population.

There is however, one important factor that characterizes the operations of law-enforcement agencies: modern societies would be in serious trouble if these agencies failed to perform

to expectations. There are therefore certain minimum performance standards imposed on the performance of these agencies.

With the existing information systems, these agencies are capable of performing satisfactorily under normal circumstances but they fail in disturbed conditions. Here, offenders can take advantage of the lack of integration of information using simple tactics like moving out, staying underground for a couple of months etc.. In these situations, when the agencies are seen to fail to meet performance standards, the usual strategy of the government is to flood these agencies with funds and other resources in the vain hope that they will "somehow" improve their performance. These agencies also measure their performance in terms of the number of the resources they deploy in troubled areas rather than on any other performance parameters. We therefore call this the saturation phase. Levels of trust are low in this phase since there are no reliable tests to distinguish the innocent from the guilty. The situation is depicted in cell 2 where the level of control is high but the levels of trust remain low.

The lack of integration of information is a significant factor in the evolution of the saturation phase. The development of this situation in many states is a big drain on the scarce resources of developing countries. It also creates an environment of insecurity for prospective investors.

3. Distributed databases, linking the existing systems would enable law-enforcement agencies to monitor and control the activities of offenders in a far more effective manner than at present. This would help improve the levels of trust between the agencies and citizens since it would now be possible to distinguish offenders from the innocent using more reliable tests. While the society moves towards a high trust-low control environment, there could be a transitional stage where the agencies improve trust without relaxing controls. This is shown in cell 3.

4. Eventually, the integration of the databases would enable the agencies to move towards creating an environment of high trust and low controls while maintaining their effectiveness in enforcing the law. We show this situation in cell 4 of Figure 1.

Implementation Issues

Linking the databases of the different agencies currently involved in maintaining records associated with law-enforcement using a client-server model would be a very effective mechanism to modernize the information systems of the law-enforcement agencies in developing countries. The exercise will initially involve a redesign of the databases currently being maintained in different offices to make them suitable for integration with other databases. It will however, not involve any radical restructuring of the existing agencies, an important factor when considering Indian agencies. Rather, it will integrate the existing data management functions of the agencies in an effective manner.

The improvements in the telecommunications infrastructure in India in recent years can act as a great facilitator for the system of distributed databases proposed in the paper to link the databases together. Though it is true that the network in developing countries is not as reliable as in the developed countries, the universal reach of the network provides a framework upon which the system can be built after accounting for the uncertainties in the network. Apart from the technical issues regarding computer hardware and software, the rights of the different agencies to modify and access data would have to be defined. While creating an exhaustive Database, the system should have built-in safeguards to prevent it from turning into a tool in the hands of Extremists to violate people's privacy. It should also be possible to implement the exercise within a reasonable time frame.

Law enforcement agencies may set an example by means of the techniques they employ to accomplish their objectives. In an underdeveloped country, police agencies are often an island of modernity, eager to use the latest technical devices, and experimenting with functionally specific role-playing. A local example of the utilization of these techniques may embolden others to innovate too. People in any country, whatever it's stage of development, look over their shoulders for new ideas to use in solving their own problems, for the courage to do what they think is required, or simply for an example that will allow them to convince others of the sensibility of their own plan[5].

The system can be put to many uses on implementation. Among others, it may be used to automate the creation of electoral rolls and identify candidates for government assistance.

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