

Fail-Soft Information Systems in Government

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Functions of Information Flow in Government

Information flows in government perform **three different functions** - they support operational decisions, they support planning or policy decisions, and they enable the processes of the executive branch to be audited and reviewed by financial auditors as well as by the legislature and, occasionally, by judicial bodies.

Failure to keep distinct these purposes and functions in the design of information systems has led to much avoidable tension between the operational managers in our bureaucracy and their confreres in the secretariats and legislatures because appropriate information is not available. Informatics professionals who have visited agency or secretariat offices while legislatures are in session will recall the frantic efforts to put together answers to parliamentary queries and the response, verging on panic, to 'starred' questions.

As a result, many important operational or planning information systems are put out for design, and the criteria set not for the primary purpose but instead largely to meet the exigencies of parliamentary questions. The hope appears somehow to be to sideline the MPs with whatever fixed data formats the new information system provides. Inevitably, as the initial experience of pivotal information systems such as the **DGTD system** show, this leads to results which do not meet the operational requirements of the men on the job. They continue with their personal 'desk-drawer' information system and use their personal telephone net for information retrieval.

Queries originating from the people's representatives should of course receive considerable attention in the design of governmental information systems. Often these are the only methods by which the preponderant power and superior information resources of the bureaucracy can be tackled by a citizen or even by a community. Full-disclosure laws are being acted on in Scandinavia, Germany and the United States to ensure that government files are always open to public scrutiny.

In another way, too, government information systems must differ from business information systems in that they have to provide for a *far more detailed audit trail*. Whereas company auditors are principally there to safeguard the interests of the members *vis-a-vis* the *management* of the company, in government the audit emphasis must needs extend much further into the agency - upto the point of its *transactions* with the public, in fact. No business could survive if it handed out money and got nothing in return, nor if its field agents accepted payments without giving value. There are so many automatic checks and balances here. But in most government operations it is essential to provide for formal audit checks at the lower levels of the agencies and especially on transactions with the public.

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The environments for operational decisions in government vary a good deal. In many situations a government administrator has exactly the same problem which a business manager would face - for example, a middle level officer in an electricity board, or a manager in a public transport utility. But generally the operational government officer has a qualitatively different situation when he must deal with people, allocating resources, issuing licences, administering a development programme, building roads, etc. Compared with the transport manager, the development officer has to assess so many more factors.

He cannot rely merely on the information generated within his organisation. He has to gather information on the real-world directly.

Policy-making in government need not be at all dependent upon current information flow. However, in view of the wide involvement of government in every facet of the economy, it can be useful if the information reaching policy levels is tailored to that need. Policies are adopted with a view to approaching certain societal goals which have been set through the political process. The policies themselves are not the goals, but **merely alternative means to the goals**. Therefore, it is essential for the policy makers at the top of the bureaucratic and political ladder to receive information which helps evaluate the likely effectiveness of the alternative policies available.

In the field of agriculture, the goal might be a certain level of production and consumption, and the alternate policies concern the support prices to be offered, the cordoning off of growing areas, and the procurement or the levy system. Likewise in industry, the goal might be a certain level of usable production, and the policies would relate to R & D support, licensing of enterprises in public and private sectors, top manager selection in the public sector, credit lines and import of technology and components.

Planning goes on in government at every level and on all subjects. A very substantial portion of the time of secretariat officers is taken up with the formulation of plans and budgets for their departments. Scientists, engineers and economists tend sometimes to think that governmental planning is what the Planning Commission does with input-output models and other mathematical techniques. Such macro-economic planning models are useful for defining ranges and likely constraints in the economy, but they leave the work of actual planning to the respective agency. Government planning, however, because it results in a budget, is recognizably similar to its counterpart activity in business.

In fact, the **PPBS - Planning, Programming, Budgeting System** - now in use in one form or another throughout the world, but devised originally by **Novick and Anthony** for **Mr. McNamara** in 1960-63, used the analogy of product-line planning and budgeting in an industry. Starting with the identification of distinct needs or purposes, PPBS defines "programmes" within an agency which can be independently planned and budgeted for. By defining very carefully the mechanism for updating a rolling Seven-year Plan, PPBS provided a detailed description of the information flow required to operate in the 'headquarters' or Secretariat end of the agency. This information came either from the operational parts of the agency in the field or from outside the department, from the environment or from other parts of government.

How Information Systems Differ in Business and Government

With this background it is possible now to begin to direct attention more pointedly to the differences between the business and government environments for information systems. We do this in order to stress the need to develop a Philosophy of Information in Government. The present paper does not attempt to provide such a Philosophy, but we hope to make clear that one is needed, that it is likely to be different from the assumptions underlying the 'MIS' movement in business enterprises, and that without such a Philosophy the introduction of computers in government may not change the level of performance significantly.

The many technological advances of the past twenty years - in communications (verbal, digital, graphic) in printing, in data processing, in reprography, in indexing and information retrieval - these form a huge reservoir of potential advantage to government systems if they are applied in concert and to the relevant aspects of governmental information.

Just as new technologies of building construction are assimilated by architects and new buildings designed to meet public purposes most effectively using these technologies, so also the different functions of information Systems in government should be appreciated and available technologies, including computers, orchestrated to support these functions.

The table below lists some of the aspects of information systems and identifies some of the significant differences we must cope with in government.

Aspects	Information Systems in Business	Information Systems in Government
1	2	3

Extent	Boundaries of the firm are clear.	Boundaries are fuzzy. Agency interests extend to industries being regulated, people and communities being served, etc.
System Goals	Overall systems - the firm -has clear goals	No explicit goals often conflicting goals or complex multiple objectives.
Goal perception	Common goals are shared by the sub-systems and the employees.	Goals rarely perceived beyond top layers of bureaucracy. Each sub-system has its own objectives of growth and power. Employees cannot correlate their own welfare to systemic goals; quite often these are directly opposed.
Communication of Information	Information flows readily and without distortion because of common goals.	Disparate subsystem goals imply considerable "filtering" of information flows both downward and upward. Internal feedback on operations Cannot normally be taken as reliable.
Criteria of Effective Design	Information Systems can be expected to be efficient; cost-benefit ratios can be the criteria in choosing the best design.	Mere "efficiency" is not adequate if it is not also failsafe or fail-soft. Government systems cannot be allowed a catastrophic failure and fail-soft design may mean "inefficiency" in normal times
Operations Control	A high degree of centralisation is feasible even though decentralisation is more effective in meeting changing environments. In either case the response times are relatively fast due to rapid and undistorted movement of information.	It is essential to decentralise operations management, for long information chains have too many inevitable delays and too low a transmission capacity to make centralised control effective in current time. Superordinate control over a decentralised system is achieved by explicit design steps to make "visible" the Information-Decision System structure of each sub-system. Such "visible" information decision subsystem can be parameterised for control by higher order systems.

Policy Control	Policy makers can review selected indicators derived from operational data. Predictions, when necessary, relate to explicit products or markets only.	Policy makers must base their actions on a 'gestalt' appreciation of the overall (government and public) system, rather than merely on internally generated information. The correct and early sensing of trends in the politico-social-economic system is an essential function for effective policy choices. Forecasting how the environment will be - upto a year ahead - is required.
Planning Base	Planning parameters are derived from operational experience. Manpower productivity and machine productivity are relatively precise figures and Can also be known to a high degree of accuracy. Corporate plans seldom extend beyond five years.	Government planning data base is required to be extensive; it is futile to expect data to be both <i>precise</i> and <i>accurate</i> . Similarly, detailed data cannot be up-to-date. Therefore, planning data systems should aim at accuracy and 'up-to-dateness' rather than precision. Very comprehensive forecasting is required of the scenario variety, requiring multi-disciplinary inputs. Preparation of contingency plans is also important since government has full responsibility for certain basics, viz. food, water, power and public safety.

Concepts for a New Philosophy of Information in Government

The concept we feel most strongly about in relation to government information systems is "fail-soft". In the Indian situation, hazards due to floods, power failure, civil disturbance or war cannot be considered rare or unimaginable. It is, therefore, necessary that all our information systems be designed to fail-soft. Their performance will, of course, deteriorate under a condition of sudden stress, but it should not collapse entirely. This condition is rarely present in the civilian situation abroad and can easily be overlooked where systems are borrowed or purchased from abroad. Another powerful concept is that which distinguishes well-defined systems from fuzzy systems. A motor car is a well-defined system. Even a small municipality on the other hand is a fuzzy system. You cannot be precise about fuzzy systems for it is difficult to learn all about them or to categorise clearly their components. Fuzzy systems can be usefully dealt with in terms of verbal variables (clean, dirty, cleaner-than-Poona, etc.) and approximate statements (the slum population of Poona is likely no more than 15 per cent and absolutely less than a quarter of the total.)

Recognising that most public systems are fuzzy does not make them out-of-bounds for data analysis, however. When a fuzzy system is internally well-connected, i.e., its subsystems are linked in an orderly way, it may be possible to improve the accuracy of any particular desired data element by simultaneously recording data from other parts of the system and relating them in the appropriate way. (Work on the application of the Cluster Analysis and non-metric scaling to fuzzy public systems is under way at the Systems Research Institute, Poona.)

Dealing with fuzzy systems at the policy level requires the Gestalt approach. (Gestalt: form, shape.) When we look at a face, we do not see eyes, nose, lips separately, and then add them together. Rather, we see the face as a whole. The whole is greater than the sum of its parts. The parts interact in a non-linear way rather than in a summation. Therefore, information analysis systems serving the policy level of government should generate Gestalt-type pictures to evaluate the effectiveness of policies.

Decentralisation leads to effectiveness where the information channels are weak or where the field situation is too complex to transmit. Here an alternative is required to direct central monitoring and control, for central control would be based upon delayed, inadequate and imperfect information about the field situation. There are other advantages also to decentralisation which assume even greater importance in government than in business. These are the growth of morale and skill-development in the administration and goodwill generated among the public when they can "talk" to a responsible officer locally and get satisfaction. Decentralisation requires to be coupled with explicit description of subsystem goals and an effective recording of sub-system transactions for later audit and review. Only goal-fulfillment information needs to be transmitted in current time, however. The coming generation of microcomputers is tailor-made for effective implementation of this type of decentralisation strategy.

Conclusion

Present day information systems in government have grown bit by bit without an overall frame of reference or philosophy. As a result, the three different purposes -Managerial, Policy, and Review (or Audit) - have at different times been given more, or less, emphasis in an ad hoc manner.

It would be unfortunate if computers are merely used to mechanise these information systems. Instead, the full power of contemporary information and communications technology should be considered in the design of information systems for government, under the control of an appropriate new philosophy which gives a suitable place to each of the main functions of these information systems, keeping in mind their differences from the world of business. This paper represents an effort to pinpoint some of these differences and to identify some of the concepts which ought to find a place in the new philosophy. We do not suggest that they are universally relevant, but they seem to be valid for developing countries like India.

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