

AN INTRODUCTION TO THE
DESIGN AND INSTITUTIONALIZATION
OF MANAGEMENT INFORMATION SYSTEMS
(MIS) FOR PROJECT MANAGEMENT



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BY

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The principal interfaces between a project's life-cycle stages and a Management Information System (MIS) are:-

- a. Project Planning & Design — MIS Design
- b. Project Implementation (and feedback)
— MIS Institutionalization, and
- c. Project Evaluation (and feedback)
— MIS Institutionalization (using MIS data)

MIS DESIGN

Ideally, the MIS should be designed concurrently with the project's formulation; while an MIS should enhance project management during implementation — through evaluation and feedback. Six basic functions have to be provided for in any Management Information System:-

1. Determine information requirements
2. Select data elements to be reported
3. Collect and Transmit data
4. Process data for analysis
5. Analyze data to develop meaningful information
6. Report (and feedback) important information
— to managers, line operators and other
interested parties — to guide future actions.

Steps one and two above require considerable managerial judgement, while steps three through six are primarily administrative-technical support functions. In identifying information requirements and selecting data elements for monitoring which can generate the information required, a crucial initial issue is who should design the Management Information System.

Over the past decade, the knowledge explosion has resulted in unprecedented specialization in the management field, and substantial knowledge has been acquired by MIS experts enabling them to create

intricate, sophisticated, systems for processing and displaying information. These management information systems -- particularly computer-based ones -- have usually been developed "in isolation" by MIS "experts" before being handed over to operational managers to use. But MIS design is not simply a mechanical or administrative process, and the failure rate for MIS -- particularly in the public sector -- is very high. Classical writers on MIS, such as Russell Ackoff have cited the lack of operational managerial involvement as one of the principal reasons for poor MIS design, and subsequent misuse or non-use of the system.¹

System's designers and operators . . . may have many virtues, but managerial competence is seldom among them.²

M. J. Riley promotes the view that operational managers should take the lead in MIS design because they are in a better position to know what is needed:

Users are the experts on what constitutes information for them. They know when and how data can provide information needed in decision making situations. Attempts by others -- even system designers -- to predict the data that a particular manager will consider to be information have not been successful on the whole.³

Disparities between the perspectives of field personnel, systems staff specialists and central ministry managers have a significant impact on the system's final design and effectiveness, but the design can only be as good as the extent of each echelon's participation, and active participation is required of top decision makers in system design and modification.

Operational managers are not always in a position to take the lead in systems design, and staff personnel are more likely to select

¹See for instance Russell L. Ackoff, "Management Misinformation Systems," Management Science, December 1967, p. 147.; John Dearden, "Myth of Real-Time Management Information," Harvard Business Review, May-June 1966, p. 123.; and Arlene Herschman, "A Mess in MIS," Dun's Review, January 1968.

²Ackoff, *ibid.* p. 116.

³M.J. Riley, Management Information Systems, (San Francisco, Calif.: Holden-Day, 1981) p. 4.

the data and indicators, as well as structure the system for data processing. Nevertheless, some collaboration is recommended and the "dirty details" should be personally reviewed and concurred in by the key managers/decisionmakers for whom the MIS is intended.

Since no two projects are ever exactly alike in substance and circumstance, each project MIS must be uniquely crafted. Management is still very much an art (despite the aura engendered by scientific management's proponents), so many of the variables — data elements and key indicators — are dictated by an individual manager's style. Although staff personnel can define subject matter, identify data elements, and structure the system for processing, where the user-manager fails to participate in the final system design, the MIS can fall short of expectations.

After it has been established who should design the system, the next step is determining what information is required and what data should be acquired to produce it.

data selection may appear to be a technical matter but in fact involves negotiation and compromise between multiple data users. . . . Design by technicians may seem simpler than political bargaining, but it will fail in the long run if influential users feel slighted. . . . "Expert" recommendations may be ignored if they are developed independently of local managers.⁴

A *laissez-faire* approach of incorporating existing data into an MIS on the grounds that it is presumably being used by someone, can produce data in different formats, but may result in little management change.

Large projects have multiple users of information with varying needs, all of whom generate different data requirements. It is extremely difficult to eliminate anything from existing systems, or integrate new data stimulated by design activity, and present it for overall project management use.

⁴Wayne Stinson, Information Systems in Primary Health Care, (Washington, D.C.; American Public Health Association, January 1983), p. 20.

An information system should be designed to focus on the critical tasks and decisions made within an organization, and to provide the kind of information that the manager needs to perform those tasks and make those decisions.³

An additional consideration in the Philippines is that data is not as readily available as in developed countries, and the cost of obtaining it is high.

Information is a product whose acquisition and processing uses up real time and resources. Furthermore, in an LDC many types of information we customarily expect within Western management are not openly exchanged.⁴

One of a manager's primary tasks in an LDC setting is finding ways to minimize the information load⁵ and still function effectively — a state of "optimal ignorance".⁶ Therefore any proposals for data gathering should be carefully examined and the feasibility and advantages weighed.

In the public sector, long range organizational goals are often imprecise and frequently numerous short range targets are externally imposed on the basis of perceived social equity (often after protracted political debate and compromise) which places the public manager in an ambiguous position. Tasked to accomplish project objectives as speedily as possible, the manager is also subject to continual scrutiny from a variety of viewpoints, but ultimately is responsible for ensuring the prudent expenditure of public funds. Reconciliation of these objectives to everyone's satisfaction is nigh impossible.

³Ibid.

⁴Jon Morris, Managing Induced Rural Development, (Bloomington, Indiana: International Development Institute, 1981), p. 45.

⁵Ibid.

⁶Warren Ilchman, "Decision Rules and Decision Roles," The African Review, Vol. 2, pp. 219-246; Cited in Jon Morris, Managing Induced Rural Development, (Bloomington, Indiana: International Development Institute, 1981), p. 45.

Peter Drucker asserts that "Without specific, clearly defined objectives and targets, managers can expect to achieve little,"⁹ and notes that the managers of most government programs do not focus on accomplishment.

On the other hand, Joseph Wholey maintains that despite the lack of a profit motive, a "results-oriented" management structure can be applied to improve government program management,¹⁰ and I share this thesis. Certainly targets are not always defined and identified precisely in many development projects, but are stated in broad, sweeping, terms without regard to resource availability.

Bruce Johnston and William Clark's sentiment is that when such statements are taken seriously as guides to action

... scarce resources are directed at glorious but unattainable goals, while less ambitious but more realistic programs wither from lack of support. Expectations are raised to impossible levels only to be dashed amid angry recriminations as the inevitable shortfalls and failures of policy occur.¹¹

An initial task therefore (which often falls to the project's MIS designers) is to define and narrow the objectives of the project itself so that it is indeed "do"-able, measurable and manageable.¹² Reducing sweeping statements to some narrower quantitative sub-objectives and realistic interim targets (based on resources available to the project) for project monitoring, management and evaluation purposes, requires a concerted project replanning and programming effort. Such a step

⁹Peter F. Drucker, "Managing the Public Service Institution" in Richard J. Stillman, II, Public Administration: Concepts and Cases, (Boston, Mass: Houghton Mifflin Company, 1980), p. 260.

¹⁰Joseph S. Wholey, Evaluation and Effective Public Management, (Boston, Mass: Little, Brown and Company, 1983), pp. 5-8.

¹¹Ibid.

¹²Often, Rural Development goals are not readily measurable, even when they can be quantified. For instance, "increasing farm family incomes by 50%" may be a desirable department development target but using it as an indicator of project performance may not be appropriate because of the lack of a direct linkage between the project's activities and outputs and this higher goal, and numerous other variables which influence this objective.

usually exceeds the authority of MIS staff designers, necessitating top management involvement, and cannot be delegated.

When the issue of "what data" has been resolved, the many intricacies of "how to process" the data have to be addressed -- i.e. format design, responsibilities for data gathering, methods of data transmission/analysis/dissemination from the source to others involved in (or affected by) the system, and frequency of reporting. In this regard, Moris observes

It is rarely feasible (or desirable) to apply a unified scheme for managing program information files. The data typically originate from four to seven different sources, not necessarily in the same agency and usually prepared by different actors.¹³

Every project is unique, and its Management Information System should be tailored to prevailing organizational and environmental conditions, to facilitate processing at each level. This requires attention to detail in the design of forms, giving consideration to transmission and processing media, and personnel capabilities. This is an area where management systems specialists traditionally excel, but which is generally neglected or treated as *ad hoc* "administrivia" by operations managers.

MIS INSTITUTIONALIZATION

When a system has been developed to management's satisfaction, the task is far from done. It must be installed in the project working environment and used by other personnel on-the-job who are unfamiliar with the intricacies of systems design. This presents some different requirements for the program's managers and MIS team, and raises a new set of issues. The following is a selection of six of the most

¹³Jon Moris, Managing Induced Rural Development, (Bloomington, Indiana: International Development Institute, 1981), p. 32.

important issues which should be addressed:-

1. Management Support
2. Training for MIS Usage
3. Incentives
4. Data Quality
5. Information Feedback
6. Administrative Capacity

1. Management Support

Strong management support appears to be a *sine qua non* -- a necessary, if not sufficient, condition for installing and operating effective management information systems.

2. Training in MIS Usage

Everyone contributing to the MIS data base as well as the users of the information produced should be aware of what is available, and why it is wanted. To ensure that the MIS staff have the skills to implement the system, and also that the users at various levels throughout the organization have the understanding to use it appropriately, some training is necessary. There are several target audiences for MIS training, and different levels of awareness and skill to be imparted to each. Thus, the need for time to be allotted, and the manner for disseminating the information -- whether extensive formal classroom training/seminars or brief informal on-the-job experience, and the need for continuing follow-up refresher training -- will vary.

Morris Solomon and Marilyn Kettinger are strong proponents of training, particularly "Action Training" -- i.e. training with real project or program teams within an organizational context using actual work tasks.

The working/learning environment created by action-training promotes high degrees of relevance, reality, and responsibility which strongly motivates participants. . . . Action-training becomes a key vehicle in the institutionalization of project management systems by the fusion at this primary level. . . . Fullest benefits are derived when all levels of involved organization and project staff participate to a relevant extent in the training program through a variety of training interventions.¹⁴

3. Incentives/disincentives

Much has been written in industrial psychology concerning behavioral aspects of workers and management. Of particular significance in MIS use is the widespread tendency of workers to resist new procedures — regardless of quality — even to the extent of dysfunctional reactions, particularly when imposed by management.¹⁵

Introduction of a management information system changes the distribution of power in an organization, disrupting the stability of established, accepted routines as well as intra- and interpersonal relationships. During the process, individual perceptions often become distorted.

Supervisory monitoring and coercion may be helpful in the short term but such scrutiny alone is usually insufficient to sustain a new system without some supplementary positive reinforcement.¹⁶ A planned approach is therefore necessary to destabilize existing reporting

¹⁴Merlyn Kettering, A Multi-Faceted Action-Training Approach for Improving Project Management: The National Planning Project in Jamaica (Washington D.C.: Development Program Management Center, January 1981) pp. 5-37.

¹⁵G. W. Dickson and John K. Simmons, "The Behavioral Side of MIS." Business Horizons, August 1970, pp. 59-71; cited by M.J. Riley, Management Information Systems, (San Francisco, Calif.: Holden-Day, 1981) pp. 266.

¹⁶Sometimes referred to as "carrot and stick" techniques, or more formally "Rewards and Sanctions".

patterns and emphasize the beneficial aspects of the new MIS without risk to the individual user.¹⁷

No organizational change effort can succeed without highly motivated personnel. . . . It is possible to motivate program or project personnel to meet deeply felt needs and stimulate creative bursts of energy, but these must be sustained by meaningful recognition of efforts and successes, including but not confined to monetary rewards.¹⁸

Joseph Wholey also endorses the concept of incentives in government programs to minimize or alleviate problems of resistance, but cautions that incentive systems can also backfire and may themselves produce negative consequences — such as distorting program operations — or (if the program's objectives are unrealistic) "lead to fraud or burnout among program managers and staff".¹⁹ This is a particularly critical issue when dealing with underpaid government employees (and particularly provincial extension agents, or similar field personnel) in developing country environments.

4. Data Quality

Obtaining "good" data on rural development projects has been a perennial problem and there is no easy solution. Key concerns (and cautions to be observed) in gathering data are:-

¹⁷Based on the Lewin/Schein "Unfreeze, Move, Refreeze" theory. See Kurt Lewin, "Group Decision and Social Change." In Readings in Social Psychology, ed. by Newcomb and Hartley, (New York: Holt, 1952) and Edgar H. Schein "Management Development as a Process of Influence." Industrial Management Review, May 1961, pp. 59-77. cited by Michael J. Ginzberg "Steps Towards More Effective Implementation of MS and MIS", in M.J. Riley, Management Information Systems, (San Francisco, Calif.: Holden-Day, 1971) pp. 296-297.

¹⁸Ibid. p. 10.

¹⁹Joseph S. Wholey, Evaluation and Effective Public Management. (Boston, Mass: Little, Brown and Company, 1983), p. 20, and p. 182.

- a. Degree of Objectivity in measurement devices
- b. Over-precision in data
- c. Conflicting reports on same phenomena
- d. Misuse (or misrepresentation) of resources (activities) monitored
- e. Changes in program content -- both program approach and/or elements within the program
- f. Time delays in gathering and reporting data from field levels to central management.

Even when these pitfalls are identified and assiduously avoided, the quality of the data is still suspect because of its source and/or origin. Most data usually originates from individuals with vested interests in proving they did a good job (or concealing from their superiors the fact that they did not) -- for example agricultural extension agents reporting on farm production and productivity. Field data is usually transmitted to the central ministry through several layers of program management, each of which incorporates additional perspectives to the processed information.

In diagnosing the health of information systems for integrated primary health care, Stinson enumerates the following symptoms of MIS malaise:-

- o Intended users ignore available information
- o Data reach users long after relevant decisions are made
- o Many data collectors fail to report, so that information represents only a haphazard sample
- o Reports are clearly inaccurate or even deceitful
- o Reports do not change month after month (suggesting too frequent data collection) or they fluctuate wildly without apparent reasons (suggesting unreliability).²⁰

This diagnosis is not exclusively a health information system syndrome. It is equally applicable to rural development projects. A more detailed exposition can be found in almost any statistical text.

²⁰Wayne Stinson, Information Systems in Primary Health Care, (Washington, D.C.; American Public Health Association, January 1983), p. 17.

Data gathering is clearly a high risk venture under any circumstances, and it is even more difficult to contend with in the Philippine Agricultural sector..

5. Information Feedback

It is important to provide the results of program activities to intermediate levels of management and field personnel so they have a sense of their performance in standardized terms and how it compares to other similar program units. Many management information systems place great emphasis on the gathering and analysis of data for top management use in the Ministry's head office, but little concern is shown for those in the field who provided the raw data in the first instance, or those who might be able to use it at the local level. Consequently, the true utility of the system may not be perceived by such personnel, and their interest in, and support of the program may wane.

6. Administrative Capacity

In the Philippines — more so than in the U.S. — a wide disparity exists between staff at the headquarters and field unit levels, in terms of both quantity and individual capabilities. Competent, well-trained individuals can be located in the Metro Manila area and persuaded to work for the government, but opportunities in the provinces are usually less attractive and positions tend to be filled by less qualified individuals. As Morris observes:-

To make services available to all sections of a district, field staffs are usually dispersed in small units located as near as possible to the farmers. The contact staffs tend to have the least training, the least access to transport, and the lowest incentives in the administrative hierarchy. They are placed in the most remote locations and made responsible for the delivery of complex technical services.²¹

These are the same individuals who are charged with obtaining and providing the bulk of the raw data input for the MIS, and upon which the entire monitoring and evaluation effort usually rests.

²¹Jon Morris, Managing Induced Rural Development, (Bloomington, Indiana: International Development Institute, 1981), p. 58.

Evaluation

If a Management Information System is structured appropriately to monitor a project during implementation, measuring final performance status and examining the various levels of the project design "logframe" — to determine whether the development hypotheses were vindicated or violated — is relatively easy. Determining why something did, or did not happen (i.e. the cause-effect) is more problematical, and requires additional effort and forethought in order to assess the impact of other possible relationships, i.e.:-

"Planned Cause" — "Unplanned Effect"

"Unplanned Cause" — "Planned Effect", and

"Unplanned Cause" — "Unplanned Effect" interactions.

From the summative evaluation standpoint, another desirable by-product of an MIS is the capability to determine the program's cost-benefit, or cost-effectiveness — i.e. was it worth doing. Johnston and Clark point out that this type of appraisal is extremely difficult to do under the best of circumstances and much analysis verges on "folk-science".²² Development projects are not usually undertaken merely because they are socially/intrinsically desirable, however, and they should also be justified, or rationalized, compared to alternate expenditures of public funds. Whether a potential project is economically worthwhile can only be estimated before the fact. During a summative evaluation, therefore, it is usually desirable to verify these assumptions and estimates, and this requires careful forethought and structuring *a priori*.

To measure project impact in its sectoral and environmental perspective, non-project data is also required for subsequent comparative purposes. Some of this data may be obtained formally from other reports, informally, or during periodic project surveys, but it

²²Bruce F. Johnston and William C. Clark, Redesigning Rural Development: A Strategic Perspective, (Baltimore: The Johns Hopkins University Press, 1983), p. 231.

may also be necessary to incorporate some elements into the project's formal MIS structure.²⁵

SUMMARY

Project data and information are processed to record transactions and to enable managers to make decisions. In as much as humans have cognitive limitations, most large organizations resort to a management analysis staff to consolidate the reported data, perform statistical analyses to identify trends and relationships throughout the whole operation, and present the significant information to the responsible managers. This review of important considerations in MIS design has posited several areas for intervention and improvement in the design and institutionalization of management information systems for Third World development programs, as follows:-

A. MIS Design

In designing a Management Information System for a development project (i.e. a "DMIS"), three main factors to take into consideration appear to be:-

1. COLLABORATIVE DESIGN - A design team should be comprised of both MIS experts and operational personnel
2. RESULTS-ORIENTATION - Project objectives (i.e. goals, purposes, targets, etc.) should be elucidated as clearly and precisely as possible.
3. STRUCTURE - Data for collection, transmission and analysis should be pre-formatted, and standardized in consonance with the capabilities of the personnel providing and processing the data.

²⁵The "user-based" concept is not limited to operational decision-makers/managers; Michael Patton also endorses a "user-based" information approach to identify information needs for evaluation purposes. See Michael Q. Patton, Utilization-Focused Evaluation. (Beverly Hills, Calif.: Sage Publications, 1978). While focussing attention on evaluation during project design is commendable, however, in practice evaluators are rarely in evidence. Even if the needs for subsequent evaluation are consciously addressed by a surrogate evaluator at this stage, experience indicates that the actual needs for evaluation are often revised.

B. MIS Institutionalization

Implementation: To enhance successful implementation of a DMIS, it appears that attention should be directed at five key aspects:-

1. LEADERSHIP SUPPORT — Continuous, overt support for the MIS by top management is required.
2. ORIENTATION & TRAINING — A combination of formal and informal training in the system for data providers, analysts and manager-users.
3. INCENTIVES — Rewards and sanctions developed to encourage personnel to provide data for, and utilize, the system correctly.
4. FEEDBACK — DMIS information disseminated via both formal and informal channels to providers of the raw data, and other "actors" in order to increase understanding, gain acceptance, and influence subsequent performance.
5. ADMINISTRATIVE CAPABILITY — Centralized data processing and dissemination, with decentralized decision-making, to the maximum extent possible.

Evaluation: Finally, to be useful for operational evaluation, the consensus of experts in the field is that a Development-oriented project Management Information System should provide sufficient data so that the organization has the capacity to perform four types of analyses:-

1. PERFORMANCE MEASUREMENT — i.e. Did the project attain its objectives?
2. HYPOTHESIS TESTING — i.e. Were the Project's basic underlying "if-then", "Planned Cause — Planned Effect" development policy assumptions correct?
3. ALTERNATE HYPOTHESIS DETERMINATION — i.e. Were there any other "Planned Cause — Unplanned Effects" and/or "Unplanned Cause — Planned Effects"?
4. COST/BENEFIT COST/EFFECTIVENESS ANALYSIS — i.e. was the project economically worthwhile? Was the project the best use of available resources?

Implicit in the foregoing is that from the outset, precise data elements be identified and gathered in a systematic manner to measure project activity over time, against the project's baseline status.



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