Training Strategies for Effective Computerization

S K Singh

Training has been a neglected area in the information systems function. When the technological perspective of the information systems function was dominant, the scope of training was restricted to upgrading/imparting technical skills for implementation of information systems. In recent years, the socio-technical perspective of information systems has gained wider acceptance and the role of training has come into sharper focus.

Information systems-related training has multiple objectives and multiple constituencies. It has to be imparted in stages and must use appropriate tools for the particular objective-constituency configuration. This paper takes a total-system view of information systems-related training and proposes a comprehensive framework to enhance the effectiveness of computerization in organizations.

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Managerial applications of computers began close to three decades ago. Computers were incorporated in organizational structures to cope with managerial challenges arising out of increasing size and complexity of organizations, and the expectation for progressive organizational effectiveness. Starting with routine transaction processing of applications, computer-based management information systems (CBMIS) have expanded considerably in their scope of application and depth of analysis. The depth of analysis has increased from routine computations to use of complex decision models to support on-going decision making through the "What-if" facility. The advent of personal computers has significantly enlarged the user organization base of computers.

Proliferation does not necessarily imply that the computers are effectively utilized by organizations. There has been increasing concern about the cost-effectiveness of growing investment in hardware and software to support CBMIS in organizations. While the cost of computerization is easy to work out, only a fraction of the benefit accrued lends itself to direct measurement. For intangible benefits like improved communication and better information support for decision making, we can only use surrogate measures like perceived user satisfaction/value/usage. An "ideal" CBMIS could, if developed and implemented, ensure improved decision making and increased organizational effectiveness. However, a review of several empirical studies dealing with measurement of effectiveness of information systems (Adams, 1975; Lucas, 1975; Senn, 1980; Turner, 1982) indicates that there is no such improvement.

A great deal of attention has been directed towards analysing the reasons for this less-than-promised benefit flowing from implementation of CBMIS in organizations. Several authors (Bostram and Heinen, 1977a, b; Srinivasan and Kaiser, 1987) have attempted to identify the factors responsible for success/failure of CBMIS in organizations and their inter-relationships. Surprisingly, training as an organizational variable having some influence on performance of CBMIS hardly finds a mention in this...
body of literature. I believe that training impinges upon a whole range of socio-technical factors which determine the level of success achieved by organizations in effectively utilizing CBMIS. In this paper, an attempt has been made to take a total-system view of information systems-related training in an organizational context and to propose a comprehensive framework for such training effort.

Relevance of Training

Introduction or major modification of computer-based information systems, by any reckoning, is an organizational change of significant dimensions. It affects a number of people in several ways. It affects the way people think and act while performing their organizational roles. It affects job content, job method, and job environment. It must, therefore, be viewed as a socio-technical phenomenon and appropriate strategies must be employed to ensure that the organization derives maximum benefit from the investment it makes in CBMIS. Training is an indispensable part of such a strategy.

Two types of training efforts are relevant in the context of computerization:

* General orientation training is directed towards increasing the computer awareness and literacy level in the organization in order to create a conducive environment for productive use of computers i.e., promoting "computer culture" in the organization. The focus is on creating ability to appreciate the rationale for computerization.

* System specific training is directed towards enhancement of knowledge and skills essential for proper development and use of specific computer applications. The focus is on creating capability not only to cope with the organizational change (computerization) but also using the opportunity for enhancement of personal and organizational effectiveness.

General orientation training should form an integral part of the normal human resources development programme of the organization. It should be included in the entry level orientation programme as well as continuing refresher programmes for existing employees. It would be desirable to organize a series of tailor-made computer orientation programmes appropriate for different levels of personnel at the start of the computerization effort in an organization.

System specific training, as distinct from normal training directed towards general human resources development, must serve two objectives to be useful:

Knowledge enhancement: enhances knowledge about the system, its role in improving the organizational performance, its relationship with other organizational systems, and its influence on various organizational constituents. This should help reduce the anxiety resulting from introduction of new system and foster positive attitude towards it thereby enhancing the probability of its acceptance.

Skills enhancement: imparts skills considered essential for coping successfully with the changes resulting from introduction of the new system. This should help all those affected by the change of system to manage their interface with the new system effectively.

Training by itself may not guarantee that the organization derives maximum benefits from introduction of CBMIS but, if properly organized, it will certainly go a long way in this direction by creating a positive environment for achieving it. Its absence will almost guarantee system failure or at least a high degree of ineffectiveness.

Current Scenario

Current IS/computer-related training practices in the country are varied and disjointed. The entry level educational programmes for both systems as well as management professionals are heavily technology and skills oriented (from a computerization perspective) and their rating varies from excellent to totally unsatisfactory. However, in this paper, our focus is on such training in the organizational context only; entry level education is assumed as given.

An organization embarking on computerization for the first time will receive some training input from hardware/software suppliers which will be directed primarily towards orienting system personnel towards the hardware/software being supplied and enabling them to make use of it. Further training effort will depend on the strategy employed for computerization. If the software development work is subcontracted to an external agency, usually the agency is also asked to provide further training input. If the software development effort is undertaken internally, one of the large number of agencies (some very good but mostly not so good) is contracted for further training input. Organizations with significant experience of computer use usually organize such training.
programmes internally. If the number of personnel involved is large, the programme is developed internally but subcontracted to an external agency. Here again the suppliers of advanced hardware, software, and communication systems provide relevant training support.

Organizations and individuals concerned have experienced following difficulties in the prevailing context:

- training imparted is too general and does not relate to the target system closely
- training tends to be mechanistic, focusing narrowly on technical aspects; does not encourage/provide opportunity for an individual to relate with the total system
- training is not synchronized properly to provide maximum help in using the new system
- training does not discriminate sufficiently between the requirements of different categories of personnel concerned
- training does not help prepare people to participate effectively in the system development-process; it has the flavour of "here is the system, let me tell you how to use it."

A comprehensive framework for information systems-related training which overcomes limitations of existing practices and will help organizations realize better value for their investment in CBMIS is proposed in the next section.

**Framework for Training**

Information management in organizations is a continuing activity. An information system passes through several distinct stages, each stage having its own training requirements. The important stages are:

- Initiation and Preparatory Processes
- System Development Processes
- System Implementation Processes
- Operation and Maintenance Processes
- System Use Processes

During each of these processes, the organizational constituencies concerned with and affected by the system will have different roles and consequently separate training needs. These constituencies are:

- Top Management
- Users
- Management
- Clerical
- Data Sources
- Management
- Clerical
- System Staff
  - Development Staff: Analysts, Programmers, Users
  - Operation Staff
    - Data Management: Control, Data Entry
    - System Operation
- Maintenance Staff: System and Data

A comprehensive framework must take into account and provide for the specific training needs of various constituencies in different phases of the IS life cycle (Table 1).

**Training Master Plan**

It can be seen from the IS training framework that IS-related training has both content and temporal dispersion. Different categories of staff require different training inputs at different stages in the life cycle of the system. The framework identifies 20 different training modules (some of which could be combined in specific cases) which, to be effective, must be delivered in a co-oriented fashion. It is, therefore, imperative that the IS project coordinator draws up a comprehensive training master plan as a subset of the IS master plan.

For each of the 20 modules (or less in case some can be combined) identified, the training master plan must specify:

- Module Title
- Target Group(s) and Size
- Objective(s)
- Contents
- Instructional Methodology
- Instructional Materials
- Duration and Mode (full time, part time, etc.)
- Schedule
- Instructor(s)
- Resources Required
- Evaluation Mode
<table>
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<th>IS processes</th>
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<td>Processes</td>
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<td>Output Interpretation System Life</td>
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<td>System Use</td>
<td>Evaluation</td>
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**Table 1: IS Training Framework**

**Organizational Constituencies**

- **Top Management**: Broad, General, Appreciation
- **Users**: Managerial, Clerical
- **Data Sources**: Managerial, Clerical
- **Information Systems Staff**: Development, Operation, Maintenance

- **Developmental Processes**
  - Monitoring System Development Effort
  - Information vs. Need Specification Procedures

- **Implementation (changeover) Processes**
  - System Description System Description System Description
  - Detailed Implementation of Outputs Detailed Data Acquisition Procedures

- **Operation and Maintenance Processes**
  - System Life System Cycle

- **System Use Evaluation Processes**
  - Output Interpretation System Evaluation System Modification
While the first four dimensions can be specified at the general level, the rest are situation specific. General dimensions for the 20 modules have been specified in the Appendix.

To be effective, most of the training inputs must be provided prior to the implementation of the system. Some general inputs related to computer hardware, software, and information systems must be included in regular HRD training. System-specific training input can be delivered in two packages, one prior to starting the system development effort and the other just prior to the implementation of the system.

Organization for Training
Choosing the agency responsible for IS training is an important organizational decision. The decision will be influenced by a number of variables such as size of organization, the age and extent of computerization in the organization, importance attached to training by top management and IS executives, IS training budget, and availability of system/training expertise within the organization. There are at least four models of organization for training:

(a) Ideally a reasonably staffed training group within the IS function would be the most appropriate training agency. This, of course, will be feasible only for organizations which have attained a certain degree of maturity in their computerization.

(b) The second alternative would be for the training effort to be jointly undertaken by the systems group and the inhouse training department.

(c) The third alternative would be to entrust the responsibility of training to an outside systems training agency in cooperation with the internal systems/training groups.

(d) Lastly, in the absence of inhouse capability both in the areas of systems as well as training, the responsibility could be entrusted to an outside systems training agency. But this approach is fraught with risks and it would be advisable to create inhouse capability in both or at least one of the two areas before embarking on an IS-related training effort.

Each organization must choose the option consistent with its stage of computerization.

Concluding Remarks
For computerization to be effective, executives and administrators must make use of CBMIS to enhance the quality of their decisions. Rigorous evaluation of CBMIS being currently used in organizations both in India as well as abroad shows a significant gap between the potential benefits of CBMIS and their actual contribution towards improvement of organizational performance. A host of socio-technical factors including ability, opportunity, and willingness of managers to make the best use of CBMIS seem to be responsible for this less-than- satisfactory state of affairs. Properly designed and coordinated IS training effort would attend to many of the problem areas and create a positive environment in which organizations can derive maximum benefit from computerization.

For training effort to be effective, a comprehensive training strategy must be worked out. Such a strategy should be based on the following considerations:

• Computerization must be viewed as an organizational change process and a socio-technical phenomenon, and not merely as a technical function.

• Training must be recognized as a powerful tool for effective implementation of organizational change.

• To be effective, training must be integrated with computerization/information systems planning and implementation processes.

• Two training needs, general orientation training and system specific training, should be catered for.

• Training requirements will be different in different phases of the computer system life cycle as well as for different organizational constituencies. A comprehensive training master plan taking into account these varying requirements will be most useful as a blueprint for the total training effort.

• Appropriate organizational mechanisms should be created for handling training responsibilities.

• Adequate resources must be provided for conducting the requisite training programs satisfactorily.

• To be effective, training effort must have complete support of top management.

If the above conditions are fulfilled, a small investment in computer/IS-related training can significantly enhance the effectiveness of computerization.
Appendix: Training Modules

Module : Top Management — Initiation
Target Group: Total top management group including highest level functional heads who are authorized to initiate a new computer system request
Objective: To create capability and inclination in the group for initiating useful and worthwhile computerization projects
Contents: General hardware and software concepts including their capabilities and limitations relevant to next level (in relation to existing level) of automation/computerization of information systems in the organization; potential for use of computers in general management/functional management areas
Duration: Two half days

Module : User Management—Initiation
Target Group: Managers who will ultimately use the system outputs for supporting various types of decisions in different functional areas
Objective: To stimulate sufficient level of interest and enthusiasm so that they can serve as sponsors for the computerization projects in their areas of responsibility
Contents: General hardware and software concepts including their capabilities and limitations; complex functional decisions and their information systems solutions; case illustrations from other comparable organizations; potential for computerized applications in their own organizations
Duration: Two days

Module : IS Development Staff—Initiation
Target Group: MIS executives and system designers responsible for information systems planning
Objective: To provide strong managerial orientation to the system development effort
Contents: Problem/decision focus of functional management; recent/advanced computer applications in various functional areas; stage/contingency theory of IS development
Duration: Four half days

Module : Top Management—Developmental
Target Group: Top management group including highest level functional heads who are responsible for controlling new system development effort in the organization
Objective: To enable top management to exercise "right" control over IS projects
Contents: IS cost-benefit evaluation; IS project planning; causes of IS failure; socio-technical perspective of IS development; monitoring IS development project
Duration: Two half days

Module : User Management—Developmental
Target Group: Managers who will ultimately use the system outputs for supporting various types of decisions in different functional areas
Objective: To impart knowledge and skills necessary for active participation in the system development process with a view to ensure dovetailing of IS with the concerned operational system
Contents: Overview of IS development methodology; role of users in system development; relationship between users and system designers; organizational mechanisms for user participation; improving the user/designer interface
Duration: Two days

Module : User Clerical—Developmental
Target Group: Clerical personnel who would be using system outputs in performance of routine operational tasks or in preparation of other reports
Objective: To enable clerical personnel to make best use of available system outputs
Contents: Analysis of existing procedures; potential for improvement; role of computers in rationalizing methods and procedures; importance of and factors affecting input data accuracy and reliability
Duration: One day

Module : Managerial Data Source—Developmental
Target Group: Managerial staff responsible for data input or supervision of clerical staff providing the data inputs to the system
Objective: To create awareness of importance of ensuring timely supply of correct input data
Contents: Nature of data and information; important data processing operations; representation of data flow; data validation and error correction; data security and access control
Duration: One day
Module: Clerical Data Source—Developmental

Target Group: Clerical staff responsible for provision of input data either through direct data entry terminals or source documents. The two groups should be treated separately.

Objective: To ensure timely availability of correct input data

Contents: Important data processing operations; manual vs. computerized data processing operations; sources and prevention of errors in computerized systems; implications of errors and their correction

Duration: One day

Module: IS Development Staff—Developmental

Target Group: Systems designers and programmers responsible for the design and implementation of the system.

Objective: To ensure that the information system designed is both effective as well as efficient.

Contents: IS Development (ISD) as an organizational change process; management dimension of ISD; technical dimension of ISD; advances in system development methodologies and approaches

Duration: Six to twelve half days

Module: Top Management—Implementation

Target Group: The entire management hierarchy concerned with implementation of the system under consideration, starting with chief executive up to the head of the concerned department.

Objective: To ensure continued top management improvement in and support for the system under implementation.

Contents: System overview, implementation plan; resource requirements and schedules; monitoring of systems projects; management of change

Duration: Two half days

Module: User Management—Implementation

Target Group: Managers who will ultimately use the system outputs for supporting various types of decisions in different functional areas.

Objective: To impart knowledge and skills essential for user managers for playing their role successfully in proper implementation of the system.

Contents: System description; role of user in effective system implementation; planning for system implementation: resources, schedules, and responsibilities

Duration: Four to six half days

Module: User Clerical—Implementation

Target Group: Clerical personnel who would be using system outputs in performance of routine operational tasks or in preparation of other reports.

Objective: To facilitate proper utilization of system outputs and to provide for smooth changeover from old to new system.

Contents: System description; purpose, structure, contents and other details of each output; output revision—implications and procedures

Duration: One day

Module: Managerial Data Source—Implementation

Target Group: Managerial staff responsible for data input or supervision of clerical staff providing the data input to the system.

Objective: To create capability for planning and controlling data acquisition, validation, transmission, and correction tasks.

Contents: System description; Detailed data acquisition, control, and transmission procedures; validation and error correction procedures

Duration: Two half days

Module: Clerical Data Source—Implementation

Target Group: Clerical staff responsible for provision of input data either through direct data entry terminals or source documents. The two groups should be treated separately.

Objective: To impart knowledge and skills necessary for successful implementation of data input and related procedures of the new system.

Contents: System description; detailed data acquisition, control, and transmission procedures; input data correction procedures

Duration: Two days

Module: IS Development Staff—Implementation

Target Group: MIS executives and system designers responsible for planning, design, and implementation of information systems.

Objective: To make IS development staff effective change agents and to impart requisite knowledge and skills.
Contents: System description; importance of implementation stage; roles and responsibilities in the implementation phase; planning and controlling implementation process; organization mechanisms for implementation; models of organizational change

Duration: Two to three days

Module: IS Operation Staff—Implementation

Target Group: IS staff responsible for data validation, updating, storage, security, and its utilization for generating required system outputs

Objective: To impart requisite knowledge and skills for smooth phasing-in of the new system and phasing-out of the old system

Contents: System description: detailed operating procedures covering
— data validation
— error handling
— updating
— output generation
— security
— integrity
— backup/recovery procedures

Duration: Three days

Module: IS Maintenance Staff—Implementation

Target Group: IS staff responsible for reviewing and auditing, updating, and enhancing the system

Objective: To provide an in-depth understanding of the system to ensure that maintainability is designed into the system

Contents: Detailed system description; maintenance parameters and their variability; change authorization and change procedures; key control and evaluation parameters; change documentation

Duration: Two to three days

Module: Top Management—System Use

Target Group: Top management group including highest level functional heads who are likely to be responsible for system performance

Objective: To create environment for high level of system performance and benefits to the organization

Contents: Detailed description of IS performance monitoring and control system

Duration: Half a day

Module: User Management—System Use

Target Group: Managers who will ultimately use the system outputs for supporting various types of decisions in different functional areas

Objective: To create ability to make best use of the IS capabilities

Contents: Detailed description of different categories of system outputs, namely, mandatory outputs, optional outputs, enhanced outputs, in terms of contents and structure, type of analysis, possible decisions supported; Cost-benefits of current and new outputs; Output modification procedures

Duration: One day

Module: User Clerical—System Use

Target Group: Clerical personnel who would be using system outputs in performance of routine operational tasks or in preparation of other reports

Objective: To create capability to make best use of system outputs

Contents: Detailed description of system outputs in terms of content, organization, and possible uses; output life cycle from receiving to destruction; procedure for new outputs

Duration: One day

References


