End user computing in Asian countries: policy lessons for development administration

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SUMMARY

End user computing requires policy initiatives very different from those needed for computerization in order to deal with the specific issues of initiation, development and institutionalization. Microcomputers provide a service and not goods or savings and require an emphasis on the dynamics of the system, where both strategic issues and operational priorities have to be set. The process is organizational, rather than a technological or a planning exercise. It requires governments to guide the change through deliberate decision making. The objective has to be to obtain the support of users at different levels. In this paper Asian experiences are compared with Western experiences to determine a framework for looking at the process. The limited set of strategies for success have also been identified.

INTRODUCTION

Microcomputers are of strategic importance in development administration. Just as industrialization was facilitated by the public provision of national statistics for marketing and production planning, development administration is an even more information intensive activity, with vast data bases, spatial diversity, dispersed beneficiaries, a wide variety of programmes and projects, and a large number of interacting organizations. Democratized and decentralized information systems also provide an equity enhancing possibility, so essential for social development. The relevant data collected by administrators since the 19th century now needs to be converted to computer readable form, and the conversion process will not be easy.

In this process government's role will be critical because the State is the major influencer of technological processes, and microcomputers will bring major changes in organizational structures and operating procedures as well as decision-making processes. Development administrators and policy makers are aware of the need to be able directly to use the new technology in order to increase administrative productivity, but because the change is so rapid they do not know how. The administrator does not buy a microcomputer but a new system or way of doing things and, as in all processes of innovation, needs a methodology to manage the transition.

Parallels from the experience of developed countries, in terms of the methodology for adoption of technological innovation, are inappropriate for developing countries. There are significant differences between *computerization* and introducing *micro*

computers. In developed countries the technology was first used to automate the status quo and save labour. The organizational implications cannot be dealt with in a step by step manner in developing countries because microcomputers are automatically introduced to improve management. In public systems the issues before developing countries are not linking micros to existing mainframe systems, as in the developed countries (Couger, 1986), but dealing with 'stand-alone' micros which can communicate with one another, if required. There is also a tremendous variance between administrative and business systems, which are the 'driver' for computerization in developed countries, because of the emphasis on environmental factors in government systems, rather than internal characteristics of the organization (Bozeman, 1986). Recent experiences in developed countries also show that the issues are of a sociological rather than a technical nature (Druker, 1988). Development of capacities for microcomputer usage are not a matter of replicating the institutions and approaches of the developed countries but of adapting them to the priorities and contextual characteristics of the developing countries (Wad, 1987). The implications encompass a broader range of concerns.

Evaluations of the methodologies adopted by governments in developed countries show that the introduction of microcomputers does not, by itself, lead to an improvement of activities. A recent examination of EDP in State Agencies in Sweden concluded that only 10 per cent of the personal computers were cost effective. They were not used in areas best suited to the technology; the required modifications to the organization and its procedures were not effected; and a systematic analysis of needs was never carried out (IDRC, 1987). There is a need for a clear strategy for administrative development formulated by the end user as a precondition for the successful use of microcomputers.

Lessons have, thus, to be drawn from the experience of isolated cases in the developing countries themselves. Here the concern of microcomputer applications and use has primarily been to resolve project bottlenecks and financial management (Bostid, 1986). The evaluations are also limited by their narrow focus. A common pitfall—as in other development studies—is to make generalizations about the operations of government on the basis of the experience of projects which have been specifically set up outside the normal administrative organization.

Most prescriptions on the policy issues have been characterizations of how microcomputing 'ought' to take place because of the limited experience with end user computing. There is a distinction between local level and end user computing, where relevance rather than sophistication is important, a factor that is often ignored. End user computing requires a focus on the decisions being taken—who takes what decisions, at what level and with what information—rather than on creating a separate computer sector, setting up an independent computer centre or looking at a function in isolation. Microcomputers will not be placed in centralized facilities but as desktop work stations. It is now being accepted that microcomputers are not an item of capital cost but of operating cost (like typewriters and photocopiers); and they are an investment with benefits to be seen not in terms of savings but improved service. The need for the required policy changes for their widespread use in decision making has not yet been accepted by most administrators, and can no longer be left to information analysts.

Two approaches are being followed by developing countries in establishing a policy for microcomputers. Some countries rely on currently used models and techniques of

development planning for designing national information plans; that is, developing a comprehensive national system in administration with a specific government machinery and systematic application. Some others are looking at different methodologies and placing increased emphasis on co-ordination of information systems and standards, on organizational relationships and on creating the right attitudes in end users as preconditions for the efficient use of microcomputers. A dynamic concept is needed to influence the transformation itself rather than simply explain it in terms of 'cause and effect'. Policy decisions will need to take early account of the effects and provide options and structures to integrate, guide and choose applications according to national requirements.

This paper looks at current trends in policy development in Asian countries and suggests a strategic direction governments should adopt for promoting end user computing: the inter-relationships of equipment acquisition, system development, and training.

POLICY AND ORGANIZATION

A policy approach is needed because attitudes to microcomputers are very much a matter of the individual's perceptions of the process; mismanagement is costly and affects the spread of computerization. The control-oriented responses of government to a new idea, programme or project activity are inappropriate for microcomputer innovations. The usual initiative is to set up a separate organization which soon grows in geometric proportion to budgets and where the size of staff symbolizes power. This structural mechanism to give direction to policy places more emphasis on controlling the acquisition of physical assets rather than managing resources.

Secondly, procedural mechanisms for co-ordination and expenditure control orders issued by Finance Ministries are also ineffective because of the nature of the processes involved; microcomputers provide a service and not goods or savings. Microcomputers will require deliberate efforts to look at decision making in organizations, rather than considering a parallel 'computer sector' of a developing country economy in the way one envisages an agricultural or energy sector.

For introducing microcomputers, in addition to the usual questions about membership and location of agencies, the role and authority of the nodal agency is the critical factor. Legislation has therefore been suggested to substantiate microcomputer policy. In the USA the Brooks Act, 1963, and the Paper Work Reduction Act, 1980, in the federal government, divide the responsibility for automatic data processing between three agencies—policy making (Office of Management & Budget), setting standards (National Bureau of Statistics), and procurement (General Services Agency). The Paperwork Reduction Act gives OMB responsibility for setting standards and developing guidelines for the way the government handles all aspects of data: automatic data processing, telecommunications and paper records. In Japan, the Provisional Commission for Administrative Reform recommended, in 1983, that an interministerial committee was needed for planning and co-ordinating computerization within government.

These central functions are very different from the reasons usually given for the setting up of such agencies: that the applications cover a wide area which cannot be reviewed by a single department; overall modification of traditional routines of

general administration are involved; and reasons of economy of scale. The objectives for the setting up of the nodal agency for implementing policy initiatives for micro-computer use cover a much wider spectrum and need to be integrated into the admini-stration. However, in developing countries the reliance continues to be on a single ministry to be fully responsible for all matters related to microcomputer use, though its functions can vary substantially—providing advice (Sri Lanka), controlling (Sin-gapore), or screening of vendors (Indonesia). In April 1988 India modified its earlier policy of placing operational, regulatory as well as purchase decisions with the Department of Electronics, by placing the responsibility for promoting computeriza-tion on the National Planning Commission, as they are the main users of data in government (see Table 1).

The experience of Asian countries clearly shows policies are successful where they have been integrated into the public sector, where operational responsibility for data processing has been divorced from policy making and where organizational concerns in implementation are being anticipated by an administrative body. The nodal agency should be a promotional rather than a regulatory body or purchasing agency. In Japan, the Management and Co-ordination Agency (MCA) carries out policies and common activities to encourage each ministry to promote its computerization, identifying major issues and discussing them in working groups. These include utilization, data bases and office automation (Ohashi, 1988)

Thus, the nature of the initial government decision has important consequences. These efforts range from the provision of hardware to ministers and top government officers (India, Malaysia), through the promotion of use (Hong Kong), to encouraging civil servants to acquire microcomputers through soft loans (Singapore). The experi-ence is that the mere provision of equipment does not ensure its use. The essential policy requirement for managing the transition, rather than providing the equipment, has not yet been recognized as the most important national concern. Developed countries are now appreciating this need, e.g. the Swedish Agency for Administrative Development (Statskontorest) brought out a purchase manual in 1986, decentralizing purchase decisions, within designated parameters, to actual users. End user involve-ment must start with the acquisition decision and not with its subsequent use.

Standardization is necessary because computer compatibility is at three levels—operating system, software, and information consistency. The *ad hoc* procurement of microcomputers can result in incompatible equipment. In India, the Natural Resource Data Management System (NRDMS) of the Department of Science and Technology, the District Information Network (DISNIC) of the National Informatics Centre (NIC), and the Resource Allocation and Processing of Information for Districts (RAPIDS) of the Computer Maintenance Corporation (CMC), both of the Depart-ment of Electronics, as well as the National Natural Management Resource System (NNMRS) of the Department of Space, are using different operating systems and software for their microcomputers placed in the Districts. Formats and codes are also different, making it difficult for separate work groups to share data, adopt a co-ordinated approach and learn from each other's experience. Thus, in the same State, Gujarat, three different projects are underway in Kheda, Surendranagar and Baroda Districts, with no compatibility amongst them (Sanwal, 1987). This problem has also arisen in developed countries: studies of the Treasury, Federal Judiciary and Army Corps of Engineers in the USA, show a general lack of co-ordination in the acquisi-tion of computers (GAO, 1982). Though the hardware issues are slowly becoming a

Table 1. Country summaries for the strategic issues: micro computers in government

Country	Initiation	Policy	Role	Implementation	Results
1. Bangladesh	1983	National Computer Committee headed by a cabinet minister	acquisition	Board National Computer	low
2. China	1984	Leading group for the promotion of Electronics Industry headed a vice premier	acquisition, personnel, co-ordination	State Planning Commission in Science and Technology	high
3. India	1988	Planning commission	operations, development	National Informatics Centre	mixed
4. Japan	1983	Management and Coordinating Agency	promotion, utilization of data	Inter-ministerial Council of Director Generals in charge of Governmental Information Systems of Ministeries	very high
5. Malaysia	1985	National Data Processing Committee chaired by a minister in PM's department	acquisition, technical operations, training	—	mixed
6. Philippines	1983	National Computer Centre	acquisition	National Information Technical Board (proposed)	low
7. Singapore	1980	Committee on National Computerization	software development, training	National Computer Board	high
8. Sri Lanka	1984	Computer and Information Technology Council	acquisition, training, operations	working committees for technical operations	mixed
9. Thailand	1974	National Computer Committee; headed by a minister in PM's office	acquisition	Budget Bureau	low

Source: Asia & Pacific Development Centre, 1987.

past problem the conscientious effort to plan for compatibility of applications has not been given sufficient importance. This can also mean sacrificing the latest technological innovations or faster speeds to functional needs.

These experiences show that for developing countries, the need is to have a national policy for setting central direction in three areas—procurement, data sharing, and training. Otherwise, in the case of microcomputers, the usual motives for centralization are not valid and, in fact, need to be guarded against. Microcomputers will affect processes, structures and people and in the resistance to change it is not apparent what is being resisted. A criteria is suggested for setting priorities to manage these issues in a three step approach requiring a specific structure and role for the nodal agency (Table 2).

Table 2.   Policy for computerization

Design stages			
Goal	**Plan**	**Issue**	**Structure**
Initiation	determination of national policy	institutional framework	ministerial committee
Spread	decentralization of operations	local level computing	administrative body
Development	institutionalization of processes	end user computing	training institute

Implementation steps			
Method	**Objective**	**Procedure**	**Role**
Quantitative spread	promote compatibility	chip & operating system standards	managing technological transition
Common data base	provide resource sharing	information standards	organizational concerns
Decision support system	develop capability to innovate	standard software for prototype applications	actor oriented strategies

PROCUREMENT

Developed countries have been through three phases in the response to information technology. In the first phase, in the late 1950s and early 1960s, large repetitive jobs were automated—motor vehicle registration, tax records, payrolls. In the second phase, until the early 1980s, organizations demanded their own mainframes and the State responded by creating an oversight unit for reviewing and approving acquisi-

tions. The third phase, from the mid 1980s, saw the acquisition of microcomputers related more to the purchase of typewriters than as a major capital expenditure. With massive expenditures for incompatible devices becoming a cause of concern, contracting procedures and consulting services were the major policy response for rationalization.

Faced with the rapidly changing technology as well as the need for organizational stability the common response of developing countries has been to seek inspiration from the second phase through which developed countries have passed in computerization —the phase familiar to information advisers at policy levels. Actually, the need for developing countries is to move towards decentralization with standardization rather than centralization of acquisition and use.

Decentralizing the purchase decision ensures 'active' involvement of the end user and limits maintenance problems. The break-through in using microcomputers in administration in India came late in 1987 with the decision of the Rural Development Department to determine parameters and allow District Officers to place their own orders. Within three months micros were available in over one quarter of the 439 districts of the country, and end users have begun experimenting with prototype applications.

INFORMATION SYSTEMS DEVELOPMENT

One of the most difficult goals to attain is motivating the computer specialist to work with non-technical user groups. A study of 6,000 computer professionals in the USA revealed that they have little need for social interaction, a great need for challenging work and find it difficult to work with managers (Couger, 1986). Officers of the Indian Administrative Service, attending computer training programmes, also consistently complain that the power of the spreadsheets was shown on the micro without telling them that a popular package was being used, and simple questions about applications were answered with a standard response—a programme will have to be developed.

The information analyst is generally a mainframe specialist and microcomputers are also new to him. Decentralized computing affects his importance in the organization and he continues to treat applications as technology-driven rather than user-driven through standard software packages. The most popular software package in the Federal Government of the United States is Lotus 1-2-3 (Kirchner, 1986) but its use is still very limited in developing countries.

There are three requirements for local level computing:

> — to reflect priorities of government in economic and social development,
> — to provide the ability to build horizontally integrated data bases, and
> — effectively and efficiently to use the resource for decision making.

Administrators alone can determine the first, computer specialists are needed for the second, and both have to work together for the third. Administrative procedures also need to be streamlined as a step towards modernization and decentralization. Since local level end users have overlapping data needs, a precondition for success is to avoid over-information and to integrate horizontally the process of computerization by using a unique identifier in all files, so that data use does not remain limited to a function, project or department, and resources can be shared between organiza-

tions as well as local and central government. A decision support system for administration will need to focus on how data is used.

Proliferation of systems without planning also hampers the enhancement of computerization. The need for co-ordination of the information system is important because the user is not the one who collects or processes the information. This also provides for future development, fluidity and synergy between systems. Singapore's National Computer Board has identified three major shared data bases concerning land, people and companies for long-run success and has avoided the duplication and divergence experienced by South Korea (APDC, 1987). The future approach of the governmental information project in Japan is to plan systematically for a data base system by getting each ministry to establish a data base for decision making; develop data bases common to ministries, and develop an information sharing system (Ohashi, 1988). Only after the strategic issues have been identified should systems analysis and prototype implementation be done, to avoid costs in rectifying the situation later.

TRAINING

End user training is necessary since the government salary scheme and conditions of service are not attractive enough to retain a sufficient number of computer personnel. Familiarization is also the key to bringing about more favourable attitudes towards microcomputers among local level officials. Most have never even seen the equipment, and mental preparation is needed to reduce the mystery and uncertainty—this has also been the experience in developed countries (Anderson & Rice, 1969). Informal networks can be profitably encouraged during training programmes which successfully develop into user groups to share experiences, as in India and Nepal.

The critical factor in training is the type of user involvement, rather than type of knowledge of techniques imparted. Groups with the greatest need for such training, people at middle levels in organizations and with a low level of general education, have fewer opportunities for training compared to the more highly skilled groups and should not be treated as passive data handlers, but given a similar input to those at higher levels in the organization. Only then can interactive usage develop.

The curricula recommended for public management education by the National Association of Schools of Public Affairs and Administration in the USA, with three levels of computer literacy courses involving appreciation, use and management for the uninitiated, for administrators who manipulate data and for professionals who understand programming, is also the dominant model for developing countries (Gortsch, 1983). Such training remains essentially technical skills oriented with either a continuing over emphasis on programming, reflecting the needs of mainframe systems, or limited to merely providing a vocabulary and tips on how to purchase equipment. The need is to remove resistance at all levels and support the planning process.

The general approach of merely sensitizing the end users also requires to be replaced with training tied to specific applications in administration in order to increase understanding. This is particularly important at the middle level because information is presently handled at this level and it is the key level in the implementation of programmes and projects. To change attitudes requires sufficient 'hands on' practice on standard spreadsheet and data base packages, as well as an input on the

functions that information systems can support, by demonstrating prototype applications and discussing case studies.

The key issue in training has implications for the organizational aspects of the process. While top level administrators need to be convinced to initiate computerization, the middle level needs continuing support to manage the process. To provide problem solving skills, funds need to be allocated for regular in-service training to cover the entire development process of computerization. This will require experience sharing, updating the know-how of users, information dissemination and assistance. The objective of developing a knowledgeable end user for the analysis of specific administrative problems, who can be assigned responsibility for managing the process, has been effectively done in Singapore, and is also being implemented in India, with encouraging results.

This training can be imparted most effectively by government training institutes. Though different approaches have been tried—by the project development group (Canada, Costa Rica, Kuwait), by the user agency itself (Austria), by a central guidance institution (Sri Lanka), or by an outside expert (Venezuela)—governments, as well as international agencies, are now strengthening their in-house facilities (U.N., 1986). In India, a United Nations Development Programme project was initiated in 1987 to cover five such centres. This is important because a massive effort will be required, and training will need to have a practical orientation to create the right climate in organizations. Training should preferably be integrated with regular in-service programmes.

CONCLUSION

There are three policy issues arising from the regular use of microcomputers in development administration:

a strong political body at the centre for establishing the strategic direction to give effect to the design requirements;

a separate administrative agency for understanding the issues in implementation, and managing data as part of the administrative function, such as resources, material and personnel;

training administrators to use microcomputers in decision making, by developing their own prototype applications as well as using available packages.

The policy for using microcomputers in development administration should aim to integrate users working in different departments and levels through a data base of information. Microcomputers should be spread within the administration only after decentralization, the development of specific applications and end user training has been completed. The major strategic issue is to create a nodal agency specifically to look at these organizational concerns, because organization and information flows are closely related.

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