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CREATING AN INFORMATION SYSTEMS INFRASTRUCTURE FOR DEVELOPMENT PLANNING

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ABSTRACT

There have been various initiatives addressing the problem of inadequate information systems for national planning in developing countries by establishing information sources or decision making capacity, or by providing technical support for data processing and communication. This paper identifies three different approaches for the creation of information systems for development planning and examines the main problems that hinder their effectiveness.

1. INTRODUCTION

Inadequacy of existing information systems is considered to be a major obstacle to effective development planning. Most developing countries lack organized repositories of information and information processing capacity; also, they lack effective communication channels to monitor the implementation and to sustain the continuity of the development process. Often individual development projects, particularly those funded by international assistance agencies and involving expatriate consultants, build information systems (IS) for their specific decision making purposes: they collect their own data and design suitable data processing computer applications. However, national development planning is an on-going activity and the necessary data cannot be collected by one-off data collection efforts. A great variety of information has to be accumulated over time from many different sources inside and outside a country, organized and distributed on request to the various planning tasks. The creation of Information Systems for Development Planning (ISDP) is an infrastructure building task, aimed at establishing IS support for a continuing decision making process.

There have been many initiatives addressing the problem of inadequate information systems for national development (Avgerou 1990a). These aim at establishing information sources, information processing capacity, and technical support for data collection, processing and communication. Almost all international assistance agencies support information development through their programs; some have been very influential with special purpose program. Yet, understanding of the effects of such initiatives is very limited. Most publications on this topic tend to describe the intentions and the technical tasks of ISDP cases (Eade and Hodson 1981; El-Hadidy and Horne 1984; Abayagunawardhana 1987), but only a few identify specific issues of ISDP or assess their effects. Nevertheless, reports on completed or abandoned projects suggest a variety of difficulties hindering the fulfilment of initial intentions (Lucking and Franks 1990; Jayasiri 1988).

Information systems for government policy making and implementation have been extensively researched in industrialized countries during the 1970s and 1980s (Kraemer and King 1986; Kraemer et al 1987; Northrop, et al. 1990; King and Kraemer 1991). Research on Information Resources Management (IRM), which examines issues of planning, organizing, directing, staffing, coordinating, reporting and budgeting for information resources and the media used to collect, process and distribute them (Burk and Horton 1988), is particularly relevant to the efforts for ISDP development. However, in most developing countries organizational and national conditions are substantially different from those studied by the IS research programs. Indicatively, as most IRM research has been done in institutions in the United States, which is one of the most data-rich countries, findings may not be applicable to countries with severe data scarcity. Indeed, the literature suggests that, so far, US institutions directed most of their efforts to the design and management of information technology infrastructures, leaving formal information management issues, which appear the most difficult to handle, to be resolved next (Caudle 1990). In contrast, for most developing countries, resolving their acute information deficiencies is an absolute priority that is being addressed either with or without information technology, and certainly without adequate theoretical guidance.

The purpose of this paper is to contribute to the understanding of the problems that hinder the building of an effective ISDP infrastructure in developing countries. The link with IS research is therefore twofold: IS research provides a perspective for the analysis of ISDP efforts and the study of ISDP cases reveals the inadequacies of current IS theory and practice to cope with the context of developing countries.

First, we present a summary of the main classes of ISDP initiatives in terms of what they undertake to contribute to the ISDP infrastructure. Then, we examine how the variety of such initiatives are organized to achieve their

goals. We distinguish three main approaches and provide representative case examples to clarify their nature.

- Large scale, centrally planned efforts for the development of a general information and information processing capacity.
- Information systems projects which aim at satisfying the specific information requirements of some planning and monitoring program.
- *Ad hoc* improvements of the capacity for collecting and handling information on a local or sector basis.

Finally, we discuss the main problems manifested in the outlined cases of these approaches in the light of current understanding of IS development and management issues and we indicate further research needs.

The picture of ISDP initiatives presented here relies primarily on secondary data, but also uses data from a questionnaire survey conducted in 1989 and 1990. Case studies are used for a closer examination of the three approaches identified.

2. INITIATIVES FOR ISDP DEVELOPMENT

The building of information resources in developing countries has been pursued with many initiatives from governments and international agencies. Initially, they followed the established institutional divisions for the management of different information categories: document referencing systems, management information systems, and quantitative/statistical information services.

Most developing countries, even with minimal research activities, have document referencing centers, but they suffer from many chronic problems, such as inadequate funds or lack of expertise to run an effective document referencing service (El-Hadidy and Horne 1984). Unesco has been particularly influential in the planning of national documentation infrastructures in developing countries, with a series of programs (NATIS, UNISIST, PGI) since the 1960s (UNESCO 1988). Document referencing is a task which requires wide knowledge and technical skills. Scientific literature grows exponentially, reported to be doubling in volume every fifteen years, and document referencing has become a tradeable activity with many new bibliographic and clearinghouse services supplied by centers in industrialized countries under market conditions. Many consider the advances in IT and telecommunications to be the way to bypass the long, tedious and expensive process of building indigenous document collection centers. Considerable efforts are directed at developing and promoting access to global databases of the United Nations on a variety of themes, such as nuclear science and technology (INIS), agriculture (AGRIS) and others (Aiyepku 1982).

The data banks in government administration institutions store vast amounts of records, as diverse as births, tax duties, or fertilizer distribution, and in most countries computers were first used for such record keeping purposes. Nevertheless, few of the record keeping applications in government departments are used for planning purposes. Most of them are designed to sustain the operations of the administration only (Kaul, Patel and Shams 1989). The few efforts to design systems in government specifically in order to meet the needs of development planning, such as the projects NIDAS (Salih 1981) and SETIA (Han and Render 1989) in Malaysia, tend to face serious problems and are often abandoned.

Statistical data collection is inadequate in most developing countries. Statistical offices were unable to cope with the increasing requests of government agencies for statistical data and they lost their role and their prestige. As users realized that they could not find the data they needed in statistical offices, they started collecting data to meet their own needs. Many agencies started producing statistics and adopted alternative approaches which include office guesswork, reports by subject matter officers, collaboration with field staff and utilization of secondary sources. Although, as Zarcovich (1975) argues, such initiatives play a significant role in meeting statistical data demands for planning, statistical data collection remains fragmented and grossly inadequate in many countries.

More recently, there has been a tendency to integrate the management of information resources, despite the prevailing perception that there are fundamental differences among these categories of information (de Grolier 1979; Miller and Velardi 1981). Indicatively, such terms appeared in the literature as "information sector" to mean statistical data services, libraries, and other bibliographical information services connected together by communication means. In the 1970s, six international agencies' collaborated to set up the design principles for an information system (DEVSI) capable of addressing the integrated issues of socio-economic development (IDRC 1976). Since then, several national and regional information systems have been designed and implemented, for example the Latin American Planning Information Network (INFOPLAN), and the Caribbean Information System for Economic and Social Planning (CARISPLAN), the Pan-African Documentation and Information System (PADIS) (Aiyepku 1982). An example of a national initiative to integrate document referencing systems, statistical information and administrative information is Bolivia's effort to develop a national information system (SYFNID), which was supported by the International Development Research Centre (IDRC), (Crowther and Riveros 1981). This project intended to consolidate the various discontinuous and narrowly focused information related activities in the country and put emphasis on the co-ordination and rationalization of the use of human and material resources.

Another category of ISDP initiatives aims at the development of decision making capacity for national development planning. Particularly significant are training efforts to create skills for information handling and decision making methods (UNESCO 1988). There is also a proliferation of computer software to support information processing for planning: from general spreadsheet packages and database management systems to specialized planning computer tools which incorporate theoretical models. More sophisticated cases are designed as complete decision support environments and include a combination of information processing tools potentially useful to planners (Ganon et al. 1990; Sherif 1990). Most such efforts assume that development planning is a process which has at its core decision making models and is backed by information. Indeed planning is often taught as a "rational" problem solving process which applies optimization techniques and other scientific models to achieve development goals (Conyers 1982; Conyers and Hall 1984). Nevertheless, development planning remains a highly problematic activity. There is no one best way to organize and work out development planning and scientific decision making methods do not hold undisputed value for this activity. Development planning takes different forms in different countries or in different socio-political circumstances. It may be performed by making systematic use of rigorous quantitative techniques, such as econometric model-building, or as a process of qualitative judgement, giving emphasis to the resolution of political and administrative problems (Dror 1971; Saasa 1985). Generalizations about how to exercise development planning tend to be ineffective. Although planning usually involves some rational/formal decision making, it is, nevertheless, shaped under political influences stemming from ideological features and cultural characteristics of its environment. Thus, the creation of information based decision making capacity does not necessarily improve a country's development planning process. Within the dynamics of culture and power, decision models are often marginalized or even misused.

Finally, there are numerous examples of initiatives to create a technological ISDP infrastructure. They range from diffusing microcomputers in planning agencies (Klosterman 1988) to installing sophisticated networks of supercomputers linked with satellite telecommunications (National Informatics Centre 1987). Nevertheless, the most significant part of the effort to build a technological capacity for supporting ISDP is not to acquire the hardware and software tools, but to develop the necessary technical skills. This is by far the most difficult task of technology transfer. It tends also to be the most neglected aspect of IT development (Odedra 1990). Consequently, there are great inefficiencies in utilizing computer systems in all developing countries: systems bought and never used, systems which are underutilized or misused because the "users" cannot use them, systems which stay idle most of the time because they cannot be maintained regularly.

3. THREE APPROACHES FOR BUILDING ISDP INFRASTRUCTURE

Despite the emphasis on the significance of ISDP, few initiatives clearly succeed in making a sustainable contribution to the improvement of a country's capacity for development planning. Some initiatives fail before even being implemented, others result in inefficient procedures which do nothing to improve planning or are largely ignored by the planning agencies. In this section, we examine how ISDP initiatives approach the achievement of their objectives. We distinguish three different approaches of ISDP projects and discuss their effectiveness.

3.1 Large Scale, Centrally Planned Information and Technical Resources

Many ISDP initiatives attempt to achieve their objectives by designing large scale information and information processing resources to cover the long term information and information processing needs of a country. They set up projects to establish networks of documentation centers, or data processing centers, or to integrate information handling facilities in national or regional information systems. They often build electronic data networks to link users with national information centers and foreign information sources. This approach is demonstrated below with the example of Thailand's National Information Network.

Thailand is planning a national network for data in science and technology (Liebenau 1991). The system is intended to bring Thai scientists in contact with the main information sources in the country and to provide access to databases abroad. It was established in outline through the Ministry of Education and in cooperation with the United Nations Information System in Science and Technology (UNISIST) within UNESCO. The network is coordinated by the National Research Council of Thailand and is intended to link eight information sources of the country: agriculture, medical sciences, energy, natural sources and environment, industries, transport and communication, education and basic science, and defence. The network will comply with standards that are being established for the Regional Network for the Exchange of Information and Experiences in Science and Technology in Asia and the Pacific (ASTINFO). Users will be able to access information centers abroad from sites at universities and government institutions. It is thought that Thai users are unlikely to feel comfortable on computer keyboards and access to the system will be through enquiry forms, aided by librarians or information services officers.

After studying the plans of this system, Liebenau found that the designers did not have a clear idea of who the potential users are and how to promote change in their capacity to use information resources. Designed as a mix of hardware and information resources, the system does

not address fundamental issues of usage, such as how to change the attitude of potential users with regard to information. Access to bibliographic data assumes an awareness of the value of information and the need to have citations of works by Thai and foreign experts. The validity of these assumptions is questionable.

3.2 Large Scale Information Systems Designed to Meet the Requirements of Development Planning Agencies

A different approach is the design of information systems intended to meet the specific requirements of national development programs. Unlike the approach described above, the starting point is not the building of a general information and information processing capacity, but the design of systems to support the decision making processes of a particular development planning agency. CRISP (Computerized Rural Information Systems Project), in India, is a system designed to provide data for planning and monitoring an anti-poverty programme for members of the rural population without any income-generating asset or saleable skill. CRISP was intended to manage the vast amount of data collected from the villages for this programme and to provide a tool for the generation and analysis of data at the district level. The present version of the system involves manual data collection from the villages and the installation of microcomputers at the level of districts for the storing of aggregate data and the generation of reports which are then used for central planning and monitoring. The specific objectives of CRISP for this stage were

- to create a computerized record of beneficiaries and works under the anti-poverty programs,
- to provide an easy method of generating various reports as requested by the central and the state governments, and
- to build a database of information about villages for planning applications in the next version of the system.

CRISP was based on the experience of a system which was designed to support one particular district. That experiment resulted in a marked increase in the district's performance, which was attributed to the use of microcomputers, and was later extended to ten districts throughout the country on an experimental basis. In 1987, the Department of Rural Development gave sanction to all its district agencies to purchase microcomputers according to centrally defined specifications. The software comprised a menu-driven application, which was developed centrally, and several tools such as Wordstar, Lotus 1-2-3 and dBase 3+.

Madon (1990) reported several major problems with and inadequacies of the way CRISP operates at present. The project has neither succeeded in increasing the efficiency

of report generation nor to facilitating the availability and analysis of micro-level data for planning. Madon also found that, in most districts, the manual monitoring of the anti-poverty programme still prevails and the CRISP system is not used for report generation. Considerable mismatch was found between the reports generated by CRISP and the reports required to be prepared by the district rural development agency for the state government.

Many barriers appear to have contributed to this failure to meet the system's objectives: inadequate provision of support and maintenance of the computer equipment, lack of awareness of administrators at the local level on the potential of microcomputers, inadequate technical skills, inadequate attention to the difference of requirement of different states and districts when the system was replicated nationwide. More importantly, Madon's research suggests that a major problem stems from the significance of the informal aspects of the anti-poverty programme which were not taken into account when the system was developed. CRISP was intended to support the administration of the programme as it was described formally, and ignored the dominance of the informal ways of data collection and decision making. As a result, there have been gross distortions in data supply at the villages that the CRISP system was unable to alleviate. Thus, the investigation of the failure of CRISP calls into question the quality of the existing administrative machinery for the management of the anti-poverty programs.

3.3 Ad Hoc Improvements of the Capacity for Collecting and Handling Information on a Local or Sector Basis

In contrast to the above centrally designed efforts to build general information resources or large scale systems for development planning, there are various cases which exploit opportunities, such as available technical resources, or circumstantial momentum, such as the presence of a facilitator and the urgency of some perceived problems, and develop ISDP resources in an *ad hoc* way. The project UTEC (Unidada Technica) of the province of Maputo in Mozambique is an example of this approach.

The origins of UTEC were rather accidental. The project resulted from the merger of two separate projects.

- A UNDP (United Nation Development Programme) project to integrate emergency projects with development projects. This was mainly an attempt to develop administrative capabilities to support planning. Mozambique has a three tier structure of planning agencies: at a national level, the national planning commission, comprising the national directorate of planning, the national directorate of statistics and the national institute of physical planning; the same structure is repeated at the province and district levels with provincial and district commissions.

- The aid project of an Italian non-governmental organization which was originally intended to develop a national database on energy resources. This project became obsolete because a broader World Bank sponsored programme was launched at about the same time. The technical resources of the project were then allocated to UTEC, mainly in the form of equipment, consultancy for the development of a geographic information system (GIS), and training for the creation of the databases and the use of the system.

- **Documentation.** UTEC collects articles from journals and newspapers on topics of interest to the provincial government.

To overcome the inadequacies of the awkward administrative structure for planning in Mozambique, UTEC was established as a "technical unit" outside the existing planning administration. The technical unit was located at the provincial level, to provide information for the planning, co-ordination and monitoring of development projects in the province of Maputo.

UTEC is an experiment of limited duration and resources. It has some tangible deliverables, such as the GIS, the databases, and the technical expertise. However, the project leaders consider it to be mainly a learning exercise, with an aim of stimulating the creation of local capacity for development planning. There are serious uncertainties about the future of the experiment. It is difficult to predict how long it can continue functioning at the side of the established administrative structure. How it will be institutionalized, transferred to other areas, and grow will greatly depend on the politics of the planning administration. There are already some worrying symptoms. For example, the technical infrastructure of the project has attracted the attention of the national planning commission and it has been claimed that the equipment of the unit should be located at the center.

Mozambique has serious problems with planning. Information gathered by the administration is unreliable and travels only upwards. There is a strong tendency for "hard" planning techniques, such as mathematical simulation and operational research. Such techniques are particularly inappropriate in a country with serious data inadequacies.

In short, UTEC is a promising effort to stimulate the creation of ISDP by developing an indigenous capacity to meet local planning needs, rather than by designing an ISDP according to prespecified needs. Nevertheless, the future of this effort is quite uncertain. The learning experiment is vulnerable to politics and administrative inertia, which it appears to be weakly positioned to face.

Recently, the World Bank and IMF started having a say in the country's development planning and many emergency and development projects have been introducing a great deal of change. The national planning commission has the very demanding task of steering new strategies of national development, but it has neither the skills nor information and technical resources for such a role.

4. CRITIQUE OF THE THREE ISDP APPROACHES

Under such circumstances, the project leaders of UTEC strived to create some local IS capacity for planning. Specifically, UTEC is intended to act as an agency capable of performing the following functions.

- **Information and analysis.** UTEC accesses the information kept at various provincial directorates, districts and national bodies, verifies, and analyses it for the purposes of particular development projects. It collects information through field work. It prepares reports on request from the provincial government. It monitors development or emergency projects. It does feasibility studies for new projects and contributes to the formation of the provincial plan.
- **Data processing.** UTEC has created statistical and geographic databases. It can produce thematic maps according to user needs.
- **Training.** UTEC has been staffed with motivated personnel from various directorates and districts. A great deal of time and effort has been devoted to training them to perform the various UTEC functions, from the technical to the administrative.

The first of the approaches outlined above appears to neglect analysis of requirements. Based on the assumption that information and information processing and communications technology are in general valuable resources for development, it attempts to build them without addressing particular questions about their use. Indeed, many efforts to develop national information networks for accessing remote bibliographic databases or other information services are primarily technology driven and neglect crucial issues of utility. It is believed that with suitable technical capacity and organizational affiliations it is possible for a researcher in a developing country to search subject bibliographic catalogues and to find the material needed in the libraries of regional centers or in industrialized countries. However, research has shown that this process of information retrieval is faced with many problems (Smithson 1989). Bibliographic searches allow little capacity for checking the relevance of a document for the researcher. Often, the relevance of a suggested document can only be checked by reading it. Certainly, the more familiar users are with the documentation of the subject area, the more chances they have to retrieve relevant documents, but this is exactly the kind of disadvantage users in developing countries are struggling to overcome. Without extensive familiarity with the documentation sources of the subject areas, and without easy access to the documents themselves - because of costs and distance -

they run the risk of becoming frustrated with a great deal of expensive and irrelevant "information."

Many initiatives for national information systems imply an integrated approach to information infrastructure development. Such initiatives are bound to be faced with serious problems because there have neither guiding integration principles to follow nor an integrated institutional basis to support them. The current ability to design formal systems to handle the different types of information together is very limited. There are barriers of institutional culture as well. Information science, concerning the storage and access of documentation, shares little common ground with IS as the discipline which studies the handling of information in organizations. Statistics is a highly formalized and sophisticated discipline which shares few of the concerns of either information science or information systems. Not surprisingly, experts in one area are not familiar with the techniques of the others. So far, theoretical efforts to deal with information issues at a general level have had little impact on practice. As a result, the various efforts to build a national infrastructure integrating all information needed for a country's development still have to deal with three distinct sets of concerns. Recent advances in IT undoubtedly release an enormous potential for the integration of information types. Research in multimedia provides remarkable possibilities for integrating textual with numerical, graphical and sound information. They can facilitate integration because they offer common tools for distinct information areas and because they create an enthusiasm for experimenting with new ideas. Nevertheless, such technology driven approaches cannot overcome the lack of theoretical integration principles, nor the lack of organizational frameworks. Also, they entail the risk of overselling technical solutions while the most difficult aspects of integration, which are organizational, remain neglected.

Ideally, all the above risks should be scrutinized during requirements analysis. Requirements determination is recognized as the most crucial aspect of IS development. Nevertheless, despite the various methods which are available for the analysis of information requirements and IS planning (Davis 1982; Earl 1987), they remain the most difficult part of IS development. In the case of ISDP, requirements analysis is not a matter of eliciting user information needs, as the main aim is to support new practices and diffuse new ways of planning. Nor is it a matter of determining what is needed to plan properly according to some theoretical model of planning or judging from the experience of established planning practices elsewhere. Of paramount importance to the analysis of requirements for ISDP infrastructure are questions regarding whether some planned information or information processing resources will be used, how effectively, and what changes are needed in order to achieve effective utilization. There is evidence both from industrialized and developing countries that, even if available, information resources may be little utilized by planners (Kraemer and

King 1986; Aiyepoku 1983). Significant lessons already exist about the factors affecting the utility of information resources in industrialized countries (Kraemer et al. 1987), but little is known about the factors affecting the utilization of information resources in developing countries. Consequently, there is little understanding of what kind of systems can effectively serve the purposes of development planning.

The second approach, exemplified by the CRISP case, indicates inability to take into account change social, organizational, and cultural aspects of the institution concerned and its broader context. Although the significance of such factors is well recognized in IS research (Kling 1987; Laudon 1985), their nature and dynamics in developing societies is poorly understood. While most IS practitioners would accept the significance of cultural factors for the successful implementation of information systems, the meaning and aspects of "culture" which are relevant to IS changes is elusive, and IS development practices have no means to take them into account. There is little evidence that the socio-technical methods practiced in European and North American environments, such as the Soft Systems Methodology (Checkland 1981), or participative techniques such as those proposed by Land, Mumford and Hawgood (1980) can be equally applicable and effective in developing countries.

In particular, the CRISP case demonstrates that government administration institutions cannot easily accommodate effective use of ISDP. Information systems such as CRISP introduce a new rationality for organizational functioning and decision making which necessitate radical changes of traditional public administration. Many government institutions in developing countries have very limited capacity to change (Avgerou 1990b). Without parallel efforts for administrative reform, it is not surprising that many innovative ISDP projects are either never implemented or end up as caricatures of their initial specifications.

Also, the CRISP project indicates that the failure of centralized efforts to infiltrate and communicate data to large segments of the national administration is partly a consequence of the more fundamental failure to steer national development programs centrally. There is no universally applicable socio-economic development pattern, and centrally decided plans of action often prove unable to anticipate and deal with the social and cultural dynamics which occur during implementation of change. Centrally administered development projects rarely allow for the necessary capacity to detect, understand and overcome problems occurring locally. Instead, they tend to impose, often by regulations, strict administrative procedures as dictated by abstract development models which often lack pragmatism.

The third approach of *ad hoc* ISDP projects is more flexible, and more capable of responding to developmental

needs than the centrally designed large scale programs. It can deal better with learning, training and experimentation. However, there are serious problems regarding the continuity of *ad hoc* ISDP projects, both in terms of time and place. It is not possible to sustain long term capacity for self-improvement of information handling within an environment which is inimical to effective planning procedures and information systems. There is a serious risk that the surrounding dysfunctioning administration will sooner or later put obstacles and disrupt the ISDP process; it will absorb its resources and cause frustration and administrative bottlenecks. To succeed, *ad hoc* initiatives will not only have to continue to be self sustainable, they must contribute to the country's overall ISDP capacity. This requires government efforts to guarantee their continuity and to promote and co-ordinate the successful results in order to benefit the national planning process. However, the distinction between co-ordination and central control is not an easy one to draw. Traditionally, bureaucratic administrative structures function by exercising control rather than by coordinating self-developing units, and short term efficiency objectives tend to impose imperatives of centralized and tightly controlled use of resources.

Although IS research has addressed the issue of control of IS resources, few relevant lessons for ISDP development can be drawn. Best known is the theoretical work by Nolan (1973; 1979), which recognizes the situation of computer applications proliferation in the various units of a corporate organization with little central control as a distinct stage in the evolution of IS in organizations. However, because of its normative nature, this theory does not provide useful suggestions regarding the future of *ad hoc* ISDP initiatives. In addition, its narrow focus on technology and managerial imperatives makes it particularly inappropriate for understanding the complex context of development planning.

5. CONCLUSIONS

In summary, most initiatives for ISDP development tend to be centrally designed, aiming at setting the foundations of national information systems. They often fail to serve the development purpose because they overestimate the existing capacity of most developing countries to utilize information resources and to implement designed large scale socio-economic and institutional change. *Ad hoc* initiatives are more likely to result in significant local ISDP improvements. Nevertheless, their long-term sustainability and contribution toward an information systems infrastructure for national planning is uncertain.

The question is not which of the three approaches is best, but how to overcome the obstacles that hinder each of them and increase their contribution to an effective ISDP infrastructure.

Although, given the currently severely limited understanding of IS management issues in developing countries, it is unrealistic to expect that effective ISDP infrastructure can be engineered centrally, it can be promoted by policies which deal not only with information sources and technology but also with issues of utilization of information for planning, administrative improvement, technology transfer and development, and institution building. Initiatives which improve the existing capacity by diffusing technical and planning know-how, by building up the capacity of local data banks and information centers, and by improving the administrative effectiveness of existing institutions should be encouraged.

The need to study the IS requirements of development programs cannot be overemphasized. Existing requirements determination methods need to be tested, adapted and enriched to become suitable for the study of the informational and organizational requirements of national development. We need to develop theories capable of encompassing contextual circumstances of the developing countries. While adequate theoretical guidance is lacking, the design and implementation of effective ISDP depends on the individual analyst's judgement of the prevailing decision making and organizational features and their ability to steer the process intuitively.

Finally, we need to learn how policies which allow for *ad hoc* ISDP improvements can also provide an organizational context which facilitates their long term continuity. The creation of a national ISDP infrastructure incrementally from self-developed sub-systems is a challenging task that needs to overcome the tendency of centralized control that prevails in most bureaucratic administrations and to devise means of effective co-ordination of distributed planning resources. This is an area of problems the solution of which current IS theory appears to be most inadequate to guide.

Longitudinal empirical research drawing from the experience of development projects is needed to develop a theoretical basis of ISDP. As the number of ISDP initiatives grows, creating a pressing demand for effective interventions, action research programs may be the most appropriate research method. Collaboration between international agencies sponsoring development programs and the IS research community may prove particularly effective to advance knowledge on the creation of an ISDP infrastructure.

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7. ENDNOTE

1. The six collaborating international agencies were the International Development and Research Centre (IDRC), International Labour Office (ILO), Organization of Economic Cooperation and Development (OECD), United Nations Development Programme (UNDP), United Nations Educational, Scientific and Cultural Organization (UNESCO), and United Nations Information System in Science and Technology (UNISIST).