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MANAGING LARGE INFORMATION AND DECISION SUPPORT SYSTEMS PROJECTS

La gestion de grands projets de systèmes d'information et d'aide à la décision

Third World Prize honourable mention

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Abstract: This paper is concerned with an approach towards management and planning of large information and decision support systems projects. It reports the application of this approach in the development of the Egyptian Minister's Cabinet Information and DSS projects.
The paper reviews current approaches and methodologies for development of information decision support systems. It highlights challenges facing developing countries, as well as the lessons gained from current knowledge, and stresses their limitations in providing approaches suitable for developing countries. It argues that developing countries should not duplicate the expensive experience of the West.

Résumé: La communication traite de la gestion et de la planification de grands projets de systèmes d'information et d'aide à la décision. Elle rend compte de l'approche employée pour les projets d'information et de SAD du Conseil des Ministres Egyptiens. La communication décrit les méthodologies et les approches courantes pour le développement de systèmes d'information et d'aide à la décision. Elle souligne les défis auxquels sont confrontés les pays en développement ainsi que les leçons qui peuvent être tirées de l'état des connaissances et montre que les approches habituelles ne conviennent pas aux pays en développement qui ne peuvent reproduire les solutions coûteuses de l'Occident.

I. INTRODUCTION

Egypt is currently implementing large scale programs for the development of a) information and decision support systems for top policy makers and executives and, b) the informatics infrastructure to help improving productivity in the country [1]. Each program consists of an evolving number of projects.

Management of the process of development, realization, and use of the large information and decision support systems is a challenging domain. Existing literature has been examining the development of information systems and decision support systems [2]. The failure as well as the critical success factors have been well taken care of. However, the current knowledge base is still short in dealing with management of large information and decision support systems projects. This is often more critical in developing countries contexts. The management and delivery of a decision support system or a group of decision support systems is not, and cannot be isolated from the context. The characteristics of developing countries, the constraints, limitations and opportunities have provided a domain for examination, research and practical applications considerable number of DSS, and/or informatics community. The idea of this work has evolved from practice in a developing country and current knowledge bases in these fields. The objectives of this paper are two folds including:

1. To present an overview of the progress todate of the Cabinet of Ministers Information & Decision Support Systems (I & DSS) projects in Egypt.
2. To propose an approach for the development and implementation of I & DSS in similar developing countries.

Besides, the lessons gained, the challenges and/or problems faced and success factors observed will be presented.

II. OVERVIEW OF THE INFORMATION AND DECISION SUPPORT SYSTEMS PROJECT

The government of Egypt has realized the importance of establishing a comprehensive information base which can provide support for the Cabinet and top policy and decision making requirements. To achieve such a strategic objective a program was designed, consisting of a number of projects, namely the "Information and Decision Support Systems Program".

The objective of such program include the following:

1. To establish a center for information and decision support systems for the Cabinet.
2. To support the establishement of decision support systems in the different ministries and to assist in making more efficient and effective use of the available informatics resources.

Project Framework

The Cabinet, in Egypt, is composed of 32 ministries and is headed by the Prime Minister, who is appointed by the President. The Cabinet thus represents the highest executive power in the country and the Prime Minister and his Cabinet members have executive as well as administrative responsibilities. This body is complemented by the legislative and judicial system.

In this domain, the program was initiated. The plan was put together early in 1985 and the program started its projects implementation in September 1985 [3].

Figure (1) illustrates the scope and framework of the Cabinet Information and DSS projects. As shown, three main levels characterize such framework, are:

Level I : Base - at the Cabinet
Level II : Egyptian (national) nodes
Level III : Foreign (external) nodes

The Base refer to the I & DSS currently being developed for the Cabinet to support their policy and decision making processes. Such systems, after its institutionalization will be comprising the Cabinet Information and Decision Support Center. Besides, the base include as well the development of information and office automation systems for the Cabinet administration.

The second level includes the Egyptian external nodes at the national domain, such as : ministries, national organizations & academic institutes. Between these nodes and the base at the Cabinet information, channels are currently established and/or strengthened.

The third level refers to accessing of the relevant and widely available international databases. Today such databases can be accessed and used by making the appropriate access using the typical telecommunication facilities in the country.

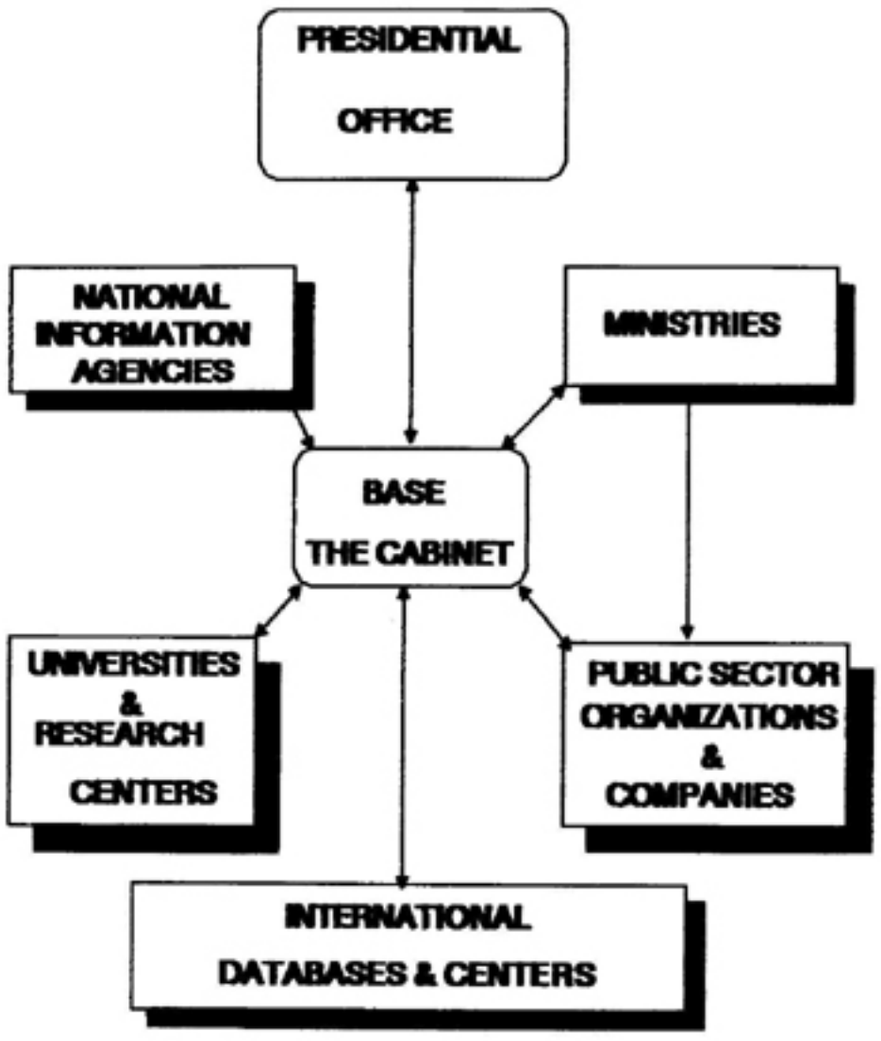

Figure (1): The Cabinet Information & DSS Project Framework

Examples of Projects

Table (1) illustrates a sample of selected projects which have been carried out. Each project has been driven by a policy need and/or decision support requirements. While any of such projects represents a challenge in the management of its implementation; together, they constitute a difficult endeavor. Today about 24 projects in progress out of which six projects will be briefly explained.

The legislation & Cabinet Decrees (LCD) project was initiated to respond to the problems recognized due to tedious procedures and resulted from often overlapping and/or contradicting decrees and legislations which induced a decreasing feasible domain for business, industries, and individuals in the country. While the Egyptian legislations and decrees go back to the year 1824, LCD has todate implemented the system and captured all legislations and decrees pertaining to the period (1957 - 1987).

Similarly is the Studies Information Systems (SIS). The project was driven by the realization that there had been over investment on studies developed and carried out by and/or for government institutions, the use of which have been very limited. Over a three months period, the system was developed and implemented and captured more than 8000 studies which represent the nucleus of the database used to support several Cabinet decisions and to provide support for Cabinet new members. The support effort is carried out by a group at the base. The project aims to link this base with sectoral nodes capable of a) capturing existing socio-economic studies and b) providing continuous sectoral and ministirial support and use.

The Flash Project objective is to monitor the pace of implementation of the five year plan in order to avoid time and cost overrun. The result of the project should help in improving institutional coordination and assist in providing timely response to problems. The project is an example of centralized planning and decentralized implementation, where implementation of the system has been carried out by the institution responsible for providing the conventional quarterly monitoring reports.

The production Information & Decision Support System follows a different type of planning and implementation approach, where there has been bilateral coordination and support and joint team implementation between I & DSS Program and Industrial registration department, at the Ministry of Industry. Results todate include: defining 95% of the new industrial five year plan development

Table (1) Example of I & DSS Projects

Project	Objectives
Legislation and Cabinet Decree LCD-MIS	Collection, storage, retrieveal and classifiacation of LCD
Studies Information Systems (SIS)	To provide a database for feasibility & other studies related to Egypt's five year plan
Project Monitoring (Flash)	To monitor the implementation pace of projects of the five year plan (monthly)
Cabinet Office Automation	To improve the efficiency of management and administrative activities in the Cabinet and Egyptian Ministries
Production Database	To provide information support about production, idle resources and capacity to help improve the efficiency and effectiveness of industrial sector
Financial & Economic Database	To provide a financial and economic database about the public sector
International Trade Information	To support the establishment of international commodity database access nodes and network among major trade agencies
Customs Reform	To provide decision support regarding the customs reform program, and to minimize multisectoral conflicts.
National Database Interfaces	To make best use of existing information resources (centers) at the national level
Telecommunication and International Databases	To introduce the telecommunication and international data base access

areas, determination of the idle resources and underutilized capacities for 55% of public sector industries. Besides a comprehensive database for 10064 industrial companies have been developed over one year period defining all resources required/used by these companies, the processes and delivery characteristics, and the production provided by each. Many questions can have answers today, including: Questions like Who is who? Where to invest? What is the distribution of a specific industry in the country? What is the industrial map of given governorate? How much energy is consumed by an industry or a company?

The Public Sector Financial Information and Decision Support Systems provides up to date monitoring for all public sector companies in Egypt, the assets of which reach today L.E.365 billion ($150 billion). The relative performance of each company with a specific industry can be easily determined. Moreover, all financial indicators, action related senarios like "what if", and specific detailed studies have become available. Such information support has been integrated with the way decisions are made by the Cabinet.

The Custom Reform Project represents a case where a comprehensive tariff structural change was required. For a number of years customs tariffs were destorted. Early in 1986, the "New Customs Program" was in its pre final shape. Over six months, debates and conflicts were growing. Then finally, a DSS system model was developed to help resolve the conflicting objectives of various ministries. For example, for certain commodities, the Ministry of Finance wanted to increase taxes while the Ministry of Industry interests were in decreasing taxes for raw materials and intermediate goods. The objectives of the model are maximization of customs tax revenue, minimization of conflicts between different ministries and minimization of impact of tariff change on low income groups. A DSS model was developed and used the result of which after multisectoral negotiation, was the agreement on the new custom tariff policy. The intervention period was just one month.

III. CHALLENGES FACED

The experience based to date have helped in indentifying three main areas of challenges: developing countries, DSS challenges and strategic decision making challenges.

Developing Countries Challenges

Developing countries represent a challenging domain for Information & DSS. The characteristics of the country, the problems faced, and opportunities existing together comprise such challenges. Among the increasingly recognized challenges are the following:

- Lack of informatics infrastructure: The use and availability of information is still limited in most developing countries.
- Lack of technical expertise: Most countries of the world are suffering from the scarcity of technical resources. Some countries like India, Brasil, Egypt have qualified human infrastructure which can potentially be developed.
- Wide application gap: The gap between practice and existing information and DSS innovations is widening.

As for the wide application gap, practitioners follow what they used to do yesterday, last year, and probably last decade. On the other hand, the advances in technology, approaches and operational tools are very rapid; yet the rate at which new technologies, techniques and innovations are diffused is still slower than desirable. Central to this is the gap between practitioners and technical expertise, each has its own jargon with very little, if any, in common.

DSS Challenges

Elam, Henderson, Keen and Konsynki [4], Keen and El Sherif [6], El Sherif [7], have presented challenges facing decision support systems. In addition, the case presented in this paper has provided a complementary set of challenges they include:

- Management of the development of a number of decision support systems (more than one system or project at the same time). Existing approaches focus only on the development of single decision support system for single or group decision making process.
- Institutionalization of DSS within the application contexts.
- DSS tools interfaces in different cultural contexts (language interfaces like Arabic in the case of Egypt).
- DSS software tools and generators, its availability and its relevance to application areas, in different industries in Egypt or other developing countries.
- DSS knowledge and its rate of assimilation in developing countries.

To illustrate one example, the previously mentioned Studies Information System has illustrated a challenge for existing information and DSS approaches,

emphasizing, apriori, the importance of designing the institutionalization process. Such project represented success at that preliminary support level. It was developed in conjunction with a key policy maker and considered to be successful technically and politically. Later on, about 18 ministers have made beneficial use of the outcome of the first version of the system. Though the process of implementation and provision of the support took three months, a stagnation of about 12 months followed. The system previously percieved as successful found no users. The system was implemented but not integrated and institutionalized with the ultimate users, an objective though recognized, has not yet been met. In short, the project which was technically successful, failed institutionally.

Stategic Decision Making

The nature of a policy making process and strategic decision making at a level like that of the Cabinet represents another set of challenges. In Egypt, examples of such challenges include:

- Efficient and effective use of scarce resources
- Achieving developmental objectives
- Crisis management
- Conflict resolution
- Formulation, development and implementation of policy reform programs.

To illustrate such challenges two example will be mentioned:
First, the Customs Reform Project represents a case of successful intervention of information and DSS and successful institutionalization. Though reforms often required, at policy making levels, many policy and strategic decision making process, take more time, effort and face social inertia. The six months of debates and conflicts which preceded the development and use of the Decision Support System, and the consensus which the same policy makers arrived at after such intervention, has provided a proven case for the importance of DSS.

Second, a drop in the oil prices and its impact as one of the major country resources. Top policies and decisions need to be made regarding a) generation of alternative sources; b) revision of the national developmental plans; c) reallocation of available resources with respect to the country development programs and d) rescheduling of the foreign commitments and debts. The recent work of Housel, El Sawy and Donnavon [8] has provided some useful lessons for information systems regarding information systems for crisis management. Still policy making domain at a country level provides additional dimensions which needs to be recognized in the development of I & DSS at that level.

IV. AN APPROACH TOWARDS MANAGEMENT OF LARGE INFORMATION AND DSS PROJECTS

The proposed approach has been adapted by the I & DSS project for management and implementation of 24 projects. Figure (2) illustrates the main components of the approach. As illustrated, there are two phases comprising such approach. Phase I concerns with the realization of the information and decision support systems while phase II focuses on the institutionalization process. The aim of phase I is to provide support for the given policy needs and/or decision requirements. This is, hopefully, carried out through use or development and implementation of appropriate information and decision support systems. Phase I consists of four main stages: 1) policy needs, 2) decision areas and requirements definition, 3) programs and projects development, and 4) DSS and information systems projects implementation.

On the other hand, phase II is concerned with the institutionalization process. Such process consists of three main components: 1) adaptation, 2) diffusion, and 3) adoption. Together, they provide the basis for the continuous use of the I & DSS being developed.

Phase I: Providing Policy & Decision Support

1.1 Policy Needs: The process of policy needs identification and determination, evolved over a year period. Responding to such needs, a preliminary policy requirement was developed and later reviewed to include two main policy requirements, which are:

A. Planned policy support requirements.
   1. To provide information and policy support for:
      a. Main issues discussed by the Cabinet
      b. Egypt's economic reform program
      c. Five year plan monitoring
   2. To develop MULTISECTORAL information basis which can support decisions in the following sectors: Financial and Economic, Production, Import and Export, Legislation, Socio-economic studies, Services (transportation, housing, ...) etc.

B. Crisis management support at the policy making level. Frequently, the Cabinet requires a study to be developed within a defined and short time frame. Such support efforts necessitate mobilization of existing resources, both human and technical, in order to achieve the expected effective response and support.

1.2 Decision Areas and Information Requirements: The second component of the approach has to do with translation of the planned policy support areas into decision areas and information requirements. Such process included:

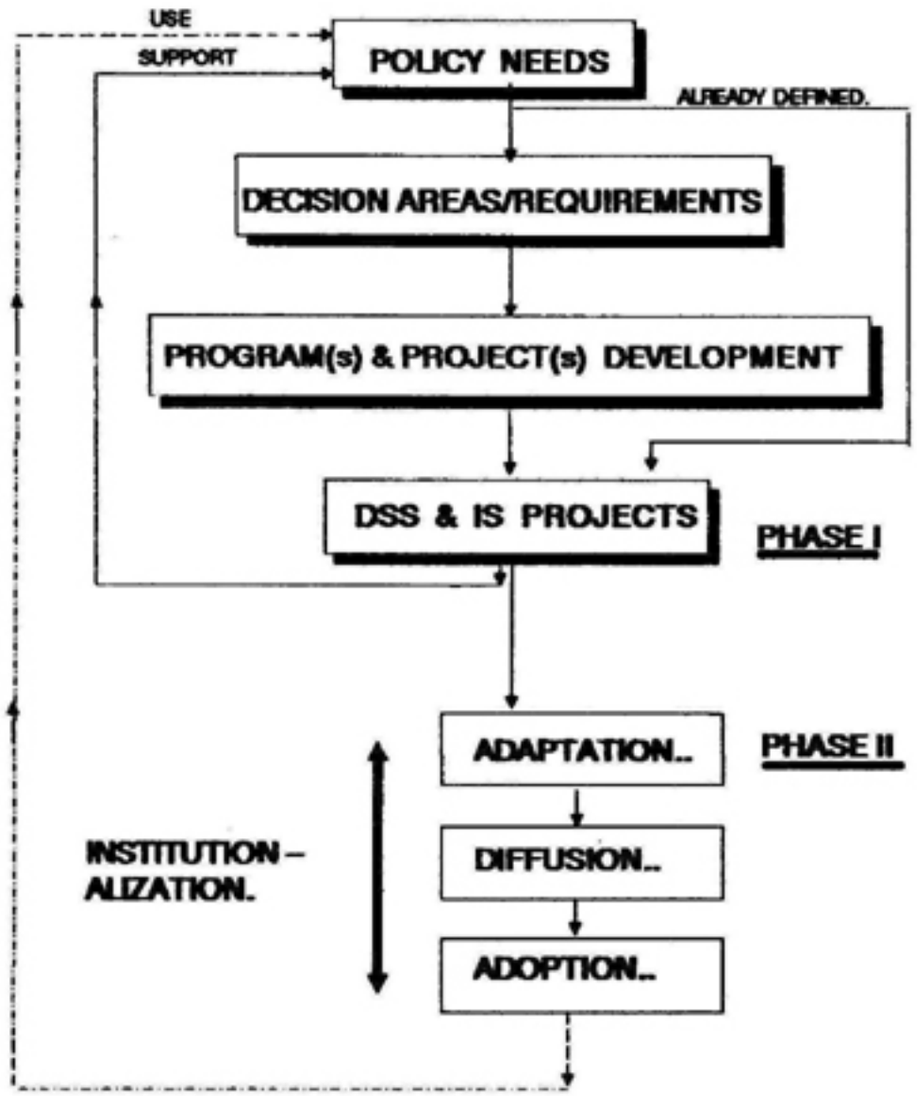

Figure (2)

specifications of major issues discussed by the Cabinet in the last 10 years, defining decision support areas for the reform program and five year plan. Both, the policy and decision support requirements impact the program and projects development and implementation processes.

1.3 Program & Projects Development: Third, for each main policy and/or decision support area, a project has been formulated with specific goals and dedicated resources. A master network and related detailed projects networks have been developed to reflect both the strategic requirement together with specific tactical deliverables. Typically, policy makers require fast response time, focus on results, and action - oriented projects. Therefore, projects have been designed with such criteria in mind. Besides, most projects consist of two-tier teams. They combine teams with interdisiplinary backgrounds ranging from those having the experience to deal with bureaucracy, typical government officials, and policy makers, and on the other hand, those who have first rate knowledge about technology. These two-tier teams proved to be very useful in narrowing the application gap(s) between users and builders or implementers of information and DSS.

1.4 DSS and Information Systems: Finally, the process of implementation of such project(s), the delivery of information and DSS varied from one project to the other. Most projects have been implemented on a microcomputer environment. While 22 out of 24, have provided concrete support to date, each can be categorized with specific implementation approach. Table (2) provides a summary of design, implementation, and current status of institutionalization of selected projects.

Phase II: Institutionalization

Quite often, builders of DSS and information systems developers do not pay enough attention to the process of institutionalization. Such process requires the design of a "change strategy" including the adaptation, diffusion, and adoption of the information and DSS. It should have an impact on the way work is done, change the way of carrying out such work if needed, and allow the dynamic development evaluation of DSS capabilities withing the application contexts. Thus, institutionalization, a synomym of use, is directly related to the extent that such information and decision support is useful.

The institutionalization strategy has basis in the existing knowledge basis and the diffusion of innovation, transfer of technology, and key concepts of adaptation of technolocy provided by DSS (e.g. the adaptive design, support user involvement).

Table (2): Approaches to Project Design, Implementation and Institutionalization

Project	Design Approach	Implementation Approach	Implementation Partner	Status
Legislation & Decrees SIS	Centralized	Centralized	--	In progress
	Centralized	Centralized	--	Successful Support/ Failed Institutionalization
Flash	Centralized	Decentralized	Ministry of Planning	On hold
Production I & DSS	Centralized	Decentralized	Ministry of Industry	Successful Support/ Successful Institutionalization
Public Sector I & DSS	Decentralized	Decentralized (manual)	Public sector Information center	Successful Implementation/Currently used by Cabinet
Customs Reform	Centralized	Centralized	Ministry of Finance	Successful Intervention/Conflict resolution

2.1 Adaptation: The first component of the institutionalization process is adaptation of I & DSS capabilities to the contextual characteristics of a particular country "Cultural Interface". Central to this, in almost all projects have been the question of arabization. The approach followed is to make use of what is available in the market from arabized software like spreadsheets, DBase III, etc. At the same time, developed some of the tools which facilitate the sue of different arabized software utilities.

2.2 Diffusion: The second component, diffusion refers to the spread of acceptable innovation within different settings within the same context. Implicity, such information and DSS capabilities should have the attributes helping in diffusion innovation including relative advantage, compatibility triability and observability. Though the project started with four micro computers in February 1986, in June 1987 more than 130 AT's are in operation and use in the different application contexts.

2.3 Adoption: The third component of the institutionalization strategy should focus on adoption process including all the capabilities, requirements and needs by a given user "user interface". A user interface should integrate both the managerial and human characteristics. Such interfaces are designed, not only to reflect the ease of use and friendliness for the ultimate user, but to consider as well his functional activities, mental context, and, in addition, his own jargon.

V. CONCLUSION: LESSONS GAINED FROM THE EGYPTIAN CASE

The lessons gained from management of the Cabinet of Ministers Information and DSS projects are numerous. They raise many questions about what we know from the existing knowledge base about: a) managing large information and DSS projects; b) application of information and DSS to developing countries context and c) interrelationship and impact of DSS on strategic decision making particularly in developing countries. Among such lessons are the following:

1. Importance of INSTITUTIONALIZATION: Institutionalization should be integrated within planning and design stages.
2. One should not confuse information and decision support concepts with computers. Some cases like public sector financial systems, which use manual techniques, have contributed to decision support and informed decisions.
3. When there is a large user gap (a big distance between the technological side and bureaucracy) use a two-tier team.
4. Simple technical solutions with the appropriate begotiation and intervention can provide effective decision support for complex issues.

5. Decomposition applying project management techniques can help in structuring decision support.
6. Developing countries should not and cannot afford to duplicate the expensive experience of the West. The contextual factors proved to be more important for the process of planning and Institutionalization than the technological products.
7. There are lessons gained in DC's which can open new avenues for understanding decision support.

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