MODEL-CENTERED GOVERNMENT DECISION SUPPORT SYSTEMS FOR SOCIOECONOMIC DEVELOPMENT IN THE ARAB WORLD

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Abstract

A computer-aided decision support system[DSS] is conceptually composed of four components; (i) Database management capabilities with access to internal and external data, information and knowledge; (ii) Modeling functions accessed by a model management system; (iii) A powerful yet simple user interface design that enables interactive queries, reporting, and graphing functions; and (iv) A decision-maker's own insights. By integrating various modeling capabilities, a DSS can be successfully used to support problem solving, policy testing, scenario simulation and strategic planning. Given the central role of mathematical models in explaining and interpreting the behavior of socioeconomic systems, DSS would represent a useful tool of analysis in this respect.

The purposes of this paper are (i) assess recent developments in model-centered DSS technology, (ii) Identify the role of DSS in improving socioeconomic development policy-making and strategic planning in the government sector and (iii) Critically review the experience of the Arab countries in developing, implementing and institutionalizing government socioeconomic model-centered DSS, with the objective of identifying challenges and learned lessons.

To achieve the purposes of this paper, DSS applications in the Arab countries are broadly divided into special purpose tools and general purpose integrated DSS. The first category represents a very useful tool for addressing a specific problem or supporting a particular decision. It builds on the specific nature of the problem under consideration to achieve more realistic and applicable solutions. The comprehensive survey-carried out by the author indicate that most of the applications in the Arab World, during the last 20 years, is based on this special purpose approach. These DSS applications include for example, foreign exchange policy in Egypt, economy-wide loss from the second gulf war, development planning scenarios for Egypt, fiscal reform program in Kuwait, external debt management system and customs tariff policy formulation.

On the other hand, general purpose DSS tools are not particularly designed for specific application, problem or issues. They provide general software capabilities that can fit several decisions using alternative analytical tools or models. This second DSS category can have, nonetheless, different orientations or trends such as; data-centered, model-centered and knowledge-centered DSS. Based on the review of DSS applications in the Arab countries, the use of this comprehensive government socioeconomic decision support tool is very limited. In the Arab countries, two representative and successful government DSS experiences are discussed and evaluated; the Development Planning Decision Support project [DPSS] of the Ministry of Planning in Kuwait and the Information and Decision Support Center [IDSC] of the government of Egypt. The Kuwaiti DSS represented a joint project carried out by the Ministry of Planning [MOP], the Department of Economic and Social Affairs [DESA] of the United Nations, and the UNDP. The Cabinet of Ministers of the Egyptian government, however, initiated the second DSS. With respect to the use of analytical tools and models, the Kuwaiti case is more advanced. It integrates the data-centered and the model-centered DSS technologies into a unified computer-based support system. Nonetheless, IDSC provides many lessons about the institutional aspects of the DSS and its computing infrastructure.

Keyword: Decision Support System, Macroeconomic analysis, Socioeconomic data system, Mathematical modeling, Modeling Languages, Development Planning.

A.Introduction[1]

A Decision Support System [DSS] can be defined as an advanced computer-aided information technology, used to support complex decision-making, problem solving, policy testing, scenario simulation and strategic planning. Conceptually, a conventional DSS model is comprised of four main components: (i) Database management capabilities with access to internal and external data, information and knowledge; (ii) Modeling functions accessed by a model management system; (iii) A powerful, yet simple user interface design that enables interactive queries, reporting, and graphing functions; and (iv) A decision-maker's own insights [33].

Much research and practical design effort has been devoted to DSS technology [1,33]. DSS tools have successfully benefited from the evolution of information technology infrastructures and the three eras of growth in the computer industry: the data processing [DP] era, the microcomputers era and the network era. The advent of Internet has given rise to many new applications of existing technology, especially the rapid dissemination of information to decision-makers. In the future, decision-makers will most probably access electronic services through their mobile phones or other wireless devices as much as through their desktop computers.

This study aims to (i) summarize and assess recent developments in computer-based tools that are used in supporting decision-making, (ii) identify the particular institutional structure of government socioeconomic decision-making process with special reference to the Arab countries, (iii) describe the role of decision support technology in improving socioeconomic development policy-making and strategic planning in the government sector, and (iv) critically review the experience of the Arab countries in developing, implementing, maintaining and institutionalizing government socioeconomic development DSS, with the objective of identifying challenges and learned lessons. This study is, therefore, primarily directed towards decision-makers in Arab States with the aim of identifying successful DSS experiences in the region.

To this end, the study is divided into five parts. After this brief introduction, section (B) provides an overview of government socioeconomic decision-making process. In Section (C), socioeconomic data and information needed for decision support purposes are discussed. Section (D) reviews decision support computer technology in terms of its origin, types and future trends. Finally, section (E) identifies and critically assesses the experience of the Arab countries in the areas of development, implementation, and institutionalization of government DSS for the purposes of socioeconomic development and strategic planning.

[1] This Paper represents a revised, updated and summarized version of a study commissioned by UNDPs' Sub-Regional Resource Facility for Arab States (SURF-AS).

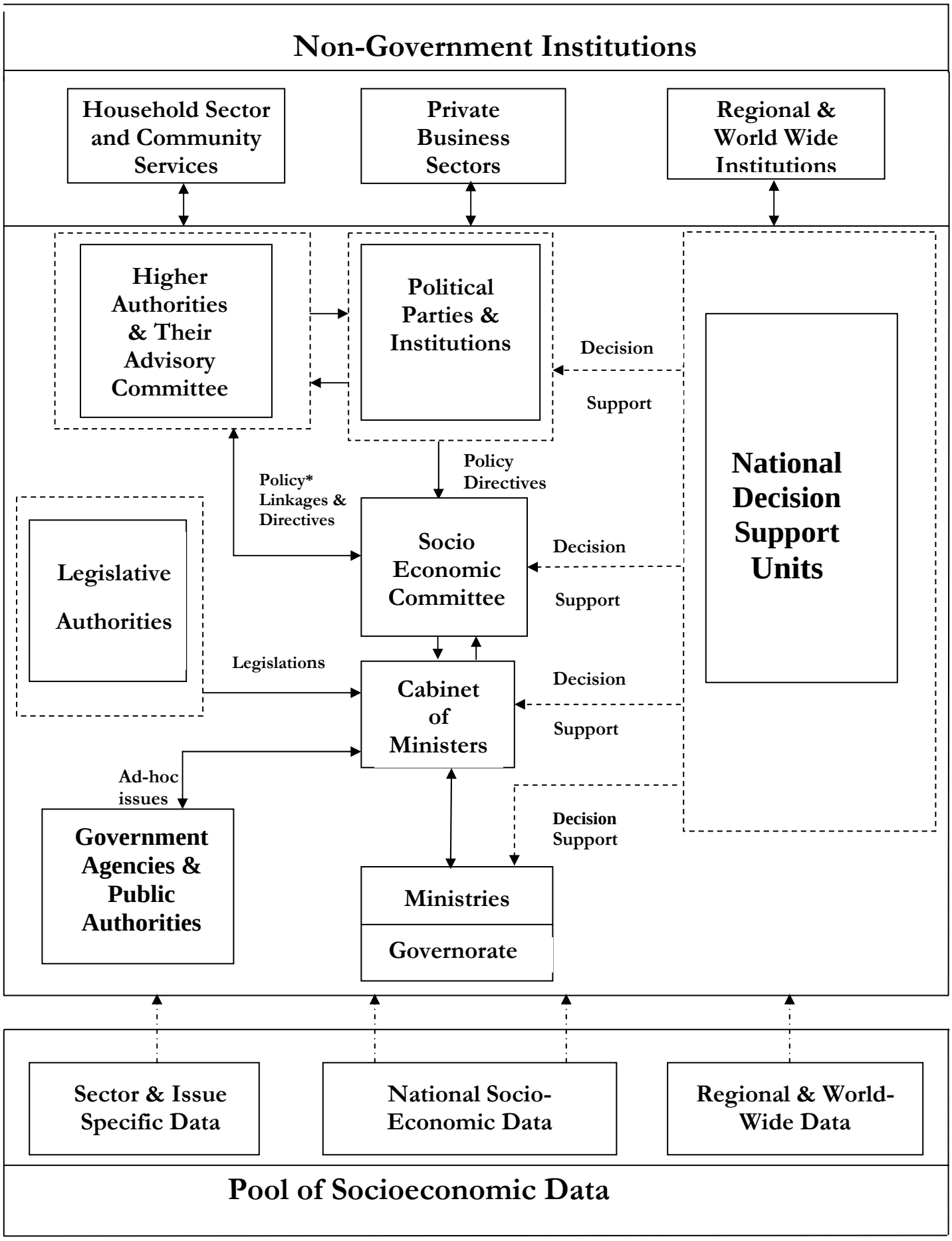
B. Government Decision-Making Process: An Overview

A principal goal, which any government strives to accomplish, is to deliver public goods and services in the most efficient and effective manner to its constituents. Good economic governance can be defined as the formulation and implementation of an optimum and sustainable (in the sense that it achieves a set of predetermined human development objectives with the least exhaustion of binding resource constraints) socioeconomic development strategy through the mobilization and coordination of available human and natural resources.

Development policies can thus, be looked at as public policies directed to satisfy the determined socioeconomic goals of a society and ultimately, to raise the quality of life of the citizens. Sustainability refers, primarily, to the institutional and functional durability of the provision of such public policies, at a required quantity and quality, over an extended period of time. The capacity of a state to satisfy the efficiency and sustainability criteria underlying the provision of sound public services will, no doubt, hinge on a number of structural, functional, and even cultural factors. In this respect, efficiency means the delivery of public service using the most appropriate technology (least time, cost, environmental degradation, etc.), whereas effectiveness signifies the achievement of a qualitative objective (raising the standards of living or more equitable income distribution).

Figure (1) represents a conceptual model for a typical Arab country's decision-making process. The Cabinet of Ministers - headed by the Prime Minister - lies at the center of the decision-making set up. Most Arab countries also have a Ministry For Cabinet Affairs to follow-up on the implementation of the decisions taken by the Cabinet. In addition a Ministerial Committee (comprised of ministers overlooking economic affairs such as Ministers of Planning, Finance, Economy, as well as the Governor of the Central Bank, and so forth) is often formed to deliberate on the recommendations proposed by national and international decision support units, before their submission to the Cabinet. However, the Cabinet of Ministers can also request decision support directly from those consultative entities. In principle, the Cabinet of Ministers interacts with ministries and governorates/localities to exchange ideas on socioeconomic policy issues, general policies, and economic reform programs. It also receives ad hoc requests from various other government agencies and public authorities attached to the state budget. These requests do not, generally, follow a constant pattern or predictable time schedule. Finally, ministries and/or local governments can also have their own decision support facilities.

In essence, the government decision support process is not a closed system. It interacts with higher authorities and their advisory committees via policy linkages and directives. Political parties also provide policy directives to enhance the decision-making process. Legislative authorities such as the National Assembly, also contribute to the formulation of socioeconomic decisions. Finally, the process of government decision-making needs to be based on a comprehensive, consistent, and relatively reliable socioeconomic data pool on the sector, national, and international levels.


Non-Government Institutions
Household Sector and Community Services
Private Business Sectors
Regional & World Wide Institutions
Higher Authorities & Their Advisory Committee
Political Parties & Institutions
Decision
Support
National Decision Support Units
Policy Directives
Policy* Linkages & Directives
Legislative Authorities
Socio Economic Committee
Decision
Support
Legislations
Cabinet of Ministers
Decision
Support
Ad-hoc issues
Government Agencies & Public Authorities
Decision Support
Ministries
Governorate
Sector & Issue Specific Data
National Socio-Economic Data
Regional & World-Wide Data
Pool of Socioeconomic Data

C. Socioeconomic Information for Decision Support

Policy-makers, strategic development planners, and senior managers in the government sector generally use three categories of information to support their decisions. These categories are technically defined as data, information, and/or knowledge.

While data, information, and knowledge are sometimes used interchangeably, they differ in their nature, their uses, and in the type of computer-based support they can provide. In principle, "Data" represent a measurement of events, activities, and transactions that are recorded, verified, classified and stored, but they are not, generally, organized to convey any specific meaning. Information, on the other hand, represents data that have been organized to provide a specific meaning to the recipient. It therefore leads the recipient to draw inferences and conclusions. To convert data into information, data-extraction and analysis routines, application programs, or computational models may be needed. Finally, knowledge strives to convey understanding, experience, accumulated learning, and expertise, as they apply to a particular problem or activity. Knowledge can be viewed as the most advanced and efficient computer-based support to make appropriate decisions. For that reason, Decision Support Systems that are formally based on knowledge processing are frequently called intelligent DSS.

C.1. An Overview of Socioeconomic Data for Development:

The decision-making process deals with information or knowledge and not raw data. These higher levels of aggregation should be extracted from detailed socioeconomic databases. In this section, we will address the classification schemes of the socioeconomic databases for decision support purposes. Although socioeconomic data can have a number of different classification schemes, this paper adopts two alternative breakdowns. The first classification rule depends on the scope and purpose of the analysis, whereas the second classification approach relies on the level of data processing or manipulation. For analytical purposes, socioeconomic data can be divided according to the following categories [23,25].

1. Macro or national socioeconomic data:
    i. Macroeconomics and aggregate social indicators
    ii. Economy-wide information
2. Sector-specific data:
    i. Institutional sectors
    ii. Production activities
3. Issue-specific data

Based on this classification rule, the macro data-category includes aggregate socioeconomic indicators and economy-wide information. Aggregates of national accounts, articulated by the United Nations SNA [38], are the main component of this category. In general, national accounting aggregates are supplemented by population, human resources, income distribution and other social indicators. Because these

indicators reflect the aggregate picture of an economy at a specific point of time, they fall short of explaining the mechanisms and linkages governing their behavior. To overcome this drawback, input-output tables, social accounting matrices, flow of fund systems and other economy-wide accounting systems are assembled and used to reflect the structural features of national economies [20,23].

The second socioeconomic data-type is the sector-specific one. This data-class divides the socioeconomic system into a set of production activities and a number of institutional units. Production activities are broadly broken down, according to the international ISIC classification, into agriculture, industry, and services sectors. They represent the production sphere of the economy responsible for the supply of goods and services to the domestic and foreign commodity markets. On the other hand, institutions represent the decision-making units within the economic system, and they are generally divided into households, private and public companies, general government, and finally, the outside world.

The third socioeconomic data category is the issue-specific one. This data-class organizes the required information according to the development issue or the economic program of interest. Since issues of interest differ from one country to another, the data of this category depend, to a large extent, on the country's own characteristics, level of development, and policy interest.

In any selected classification criteria, socioeconomic information can be divided into three categories: (a) Statistical data systems, (b) Socioeconomic accounting framework, and(c) Analytical or planning indicators. Statistical data are based on field data collected using representative samples or complete censuses. This category includes, for instance, household budget surveys, labor force sampling surveys, annual industrial establishment surveys, and population censuses. A second category uses the collected statistical data systems to assemble consistent and comprehensive socioeconomic accounting frameworks [20]. Examples of such systems include input-output tables, social accounting matrices, flow of fund tables and demographic accounting matrix. In principle, these accounting structures form the bases for economy-wide analysis. Finally, the third category consists of the analytical indicators generated from the socioeconomic accounting systems. It is used generally, to assess the performance and behavior of the socioeconomic development systems.

C.2. Sources of Socioeconomic Development Data:

A good deal of the socioeconomic information used for development planning is produced and disseminated by governmental institutions. National socioeconomic data - in the majority of the Arab countries - are produced by the Statistical Offices of the Ministry of Planning. Other countries use, however, independent central statistical agencies or public authorities for civil information to generate such information. Sector-specific information is generally provided by the relevant ministries, as well as public agencies and authorities.

In Egypt, for example, most of the socioeconomic data on the national level are produced by the Central Agency for Public Mobilization and Statistics [CAPMAS], and the Ministry of Planning [MOP]. CAPMAS is the main source of data, based on field surveys and censuses. The MOP, on the other hand, produces national income and expenditure accounts. Given that the MOP is responsible of formulating medium-term socioeconomic plans for Egypt, it also possesses the largest database for investment projects. On the sector or activity level, data are disseminated by several governmental agencies. As a general practice, the Central Bank of Egypt [CBE] is the main source of financial sector and banking information; government financial accounts are produced by the Ministry of Finance; while information on public sector firms is provided by the Ministry of Public Enterprise. Other socioeconomic data are the responsibility of the specialized government agencies and authorities (statistical offices at the Ministries of Agriculture, Health, Education, Manpower, etc.).

D. Review of Decision Support Computer Technology

Decision Support Systems [DSS] are generally defined as a computer technology that can be used to support complex decision-making and problem solving. They represent a new and evolving information technology in problem solving, performance evaluation, decision-making, and strategic planning. As noted earlier, a DSS model includes components for database management, modeling, interface with users, and the decision-maker's own insights [33,36]. Much research and practical design effort has been conducted in each of these domains [1,33]. A conceptual DSS model is outlined in figure (2).

The distinguishing feature of this new emerging technology that separates it from other computer-aided systems, such as management information systems [MIS] and expert systems [ES], is its reliance on mathematical models, simulation techniques and other quantitative tools. Because these quantitative tools are particularly designed to evaluate alternative decisions, test policy measures, assess the impact of functioning rules, and project future performance, they can, consequently, represent an efficient experimental tool to support strategic decisions.

DSS tools have evolved significantly since their early development in the 1970s. The evolution of information technology infrastructures parallels the three eras of growth in the computer industry: the data processing [DP] era, the microcomputers era, and the network era. The advent of Internet has also given rise to many new applications of existing technology, especially the rapid dissemination of information to decision-makers. In the future, decision-makers will most probably access electronic services through their mobile phones or other wireless devices, as much as through their desktop computers.

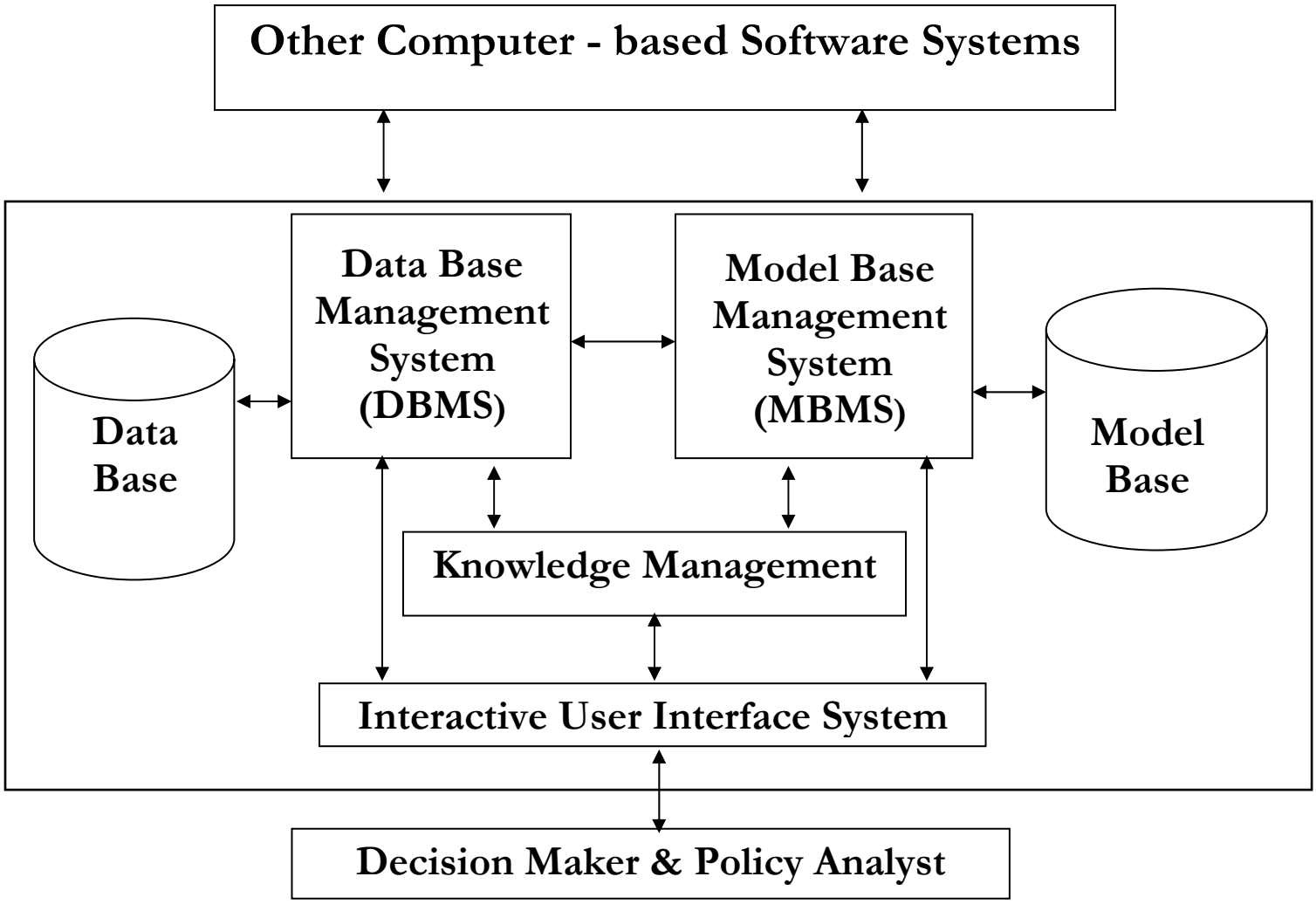


Figure (2) A Conceptual Model of a Decision Support System

D.1. Origin of Decision Support Systems:

The DSS concept was originally defined by integrating categories of management activities and types of decisions to form a Decision Support System. In principle, management activities consist of strategic planning (executive decisions regarding overall mission, goals, and medium-term performance), management control (middle management guiding the organization to goals), and operational control for directing specific tasks by the supervisor. On the other hand, Turban [36] described decision problems as ranging from programmed (routine, repetitive, or structured problems) to non-programmed (new, novel, un-structured, or difficult to solve problems).

Based on this conceptual vision, DSS was defined as "a computer system that deals with a problem where at least some stage was semi-structured or unstructured". A computer system could be developed to solve the structured portion of a DSS problem, but the judgment of the decision-maker was brought to bear on the unstructured part, hence constituting a human-machine problem solving system"[33].

D.2. Future Trends of Decision Support Systems:

Beginning in the early 1990s, four powerful tools emerged for building DSS (in addition to models and model-base management systems). The first new tool for decision support was the data warehouse. The two new tools that emerged following the introduction of data warehousing were: On-Line Analytical Processing [OLAP] and Data Mining. The fourth new tool set is the technology associated with the World Wide Web [33]. In the early 1990s, only a few custom-built data warehouses existed. However, Inmon [17] promoted the data warehouse, as a solution for integrating data from diverse operational databases, to support management decision-making.

A data warehouse is a subject oriented, integrated, time-variant, nonvolatile collection of data [17,27]. OLAP is a category of software technology that enables analysts, managers, executives or decision-makers to gain insight into data through fast, consistent, interactive access to a wide variety of possible views of information that have been transformed from raw data to reflect the real dimensionality of the enterprise as understood by the user. In fact, OLAP represents the cornerstone of the data-centered DSS (to be addressed in section D.3). Following the development of the OLAP, a set of artificial intelligence and statistical tools, collectively called data mining and information discovery tools [11], have been proposed for more sophisticated data analysis. In general, data mining tools find patterns in data, and use these patterns to infer rules [28]. In the first decade of the twenty-first century, it is expected that the Web environment will emerge as a very important tool for DSS development and as a powerful delivery platform. Accordingly, a Web-based DSS is a computerized system that delivers decision support information or decision support tools to a manager or analyst using a Web browser such as Netscape Navigator or Internet Explorer. Using a Web-based DSS can then, reduce technological barriers and make it easier and less costly to construct decision-relevant information and model-driven DSS.

The frequent use of various DSS tools in decision-making and problem solving has contributed to the development of new trends and approaches. One trend is the increasing sophistication of model-centered DSS [23]. Another trend is the development of collaborative support systems [30,39]. In particular the Group Decision Support System, or simply GDSS, is a DSS specially designed to facilitate and enhance the communication-related activities of team members engaged in cooperative work. Finally, Active Decision Support Systems [ADSS] represent a third and important trend in the future development of DSS technology. An active DSS is a system wherein the computer and user (or decision-maker) work as partners in the problem solving process [5,9]. ADSS relies generally on both artificial intelligence techniques, and DSS tools to achieve the required partnership between user and computer systems [5,34].

D.3. Classes of Decision Support Systems:

Our classification criterion here, distinguishes between special and general purpose DSS. The first category concentrates on either a specific problem or a specific tool of decision analysis [9,23,25]. On the other hand, the second category of DSS can be based on a specific analytical tool or computational model. For example, a number of Decision Support Systems are organized around computer simulation techniques. Other DSS tools are based on optimization models.

The general purpose computer-based DSS can be broadly classified as data-centered, model-centered, or knowledge-centered. This DSS category is generally designed to provide an integrated or comprehensive set of tools that can be used to handle multiple problems or application types.

In a data-centered DSS, the main emphasis is on acquiring, filtering, testing, and consolidating data from external and internal sources with the objectives of generating appropriate indicators and reports for supporting strategic decisions. These data analysis activities are generally handled by a data-extraction software system, which is used to create an analytical database (or a data warehouse), and an On-Line Analytical Process [OLAP] for the manipulation of data and the computation of appropriate indicators.

The On-Line Analytical Process [OLAP] offers the following capabilities to support the decision-making process:

- Accessing the analytical database in order to retrieve various analytical indicators requested by the decision-maker.
- Generating flexible, dynamic ad hoc reports directed to achieve the analytical objectives of the policy-maker.
- Applying simple computational models to get more insights about the decision problem.

In order to efficiently carry out the above activities, the OLAP is equipped with efficient data-manipulation algorithms such as the drill-down and roll-up features. In addition,

data mining systems can be specifically used to explore data, discover knowledge, or harvest information. When a data mining facility is linked to the OLAP, it allows quick discovery of the appropriate indicators, even by non-programmers. For more information on the data-centered DSS and the On-Line Analytical Process [OLAP], interested readers can consult the references [27,28,35,36].

The model-centered DSS relies explicitly on quantitative models and Model-Base Management Systems [MBMS] to support decision-making and strategic planning. The need for a model-centered DSS arises from the fact that decision-making on the strategic and tactical levels, requires more than flexible reporting and appropriate analytical indicators. Most of these decisions need to be based on the formulation, testing and evaluation of policies and alternative options. Because computational models mainly offer such advanced capabilities, this computer-aided DSS concentrates on model manipulation and not data manipulation. Robert Blanning [3] in his excellent review of model management systems in 1993, stated that "During the past fifteen years there has been an evolution in the type of information sources used in DSS from an emphasis on stored data and data analysis to an increased reliance on decision models [3,29]. This has led to a growing discipline of model management [2,3,4,7,10,22,25]".

The central part of the DSS is a model-base containing a comprehensive set of computational and analytical models that are managed by a Model-Base Management System [MBMS]. The purpose of a model management system is to insulate the users of a DSS from the physical aspects of model-base storage and processing, just as the purpose of a data management system is to insulate users from the physical aspects of database storage and processing. This suggests a duality between stored data and decision models [4,10]. An MBMS should then, perform operations or functions similar to those provided by a DBMS such as: creating, retrieving, deleting, or updating a model.

In general, the management functions of the MBMS are broadly divided into model creation and maintenance, and model manipulation functions. Model creation or construction relies on the following two software systems:

1. A model building language concerned with model implementation, verification, solution, and testing [26].
2. A computer-aided model construction system, directed to enhance the productivity of model builders by automating the phases of the model building cycle. This software interacts with the selected modeling language in order to make the model- building process more systematic and transparent [2,29].

The model manipulation or management software functions are as follows:

- Model integration software used primarily to incorporate the developed models into the model-base and assign to them appropriate classification parameters in support of the model selection process.

- Model selection software that can be used to select a model (or a set of models) based on the criteria specified by the user [3,23,25].
- Model execution software, directed to assist non-modelers in running complicated models in a friendly manner. The model execution function should provide friendly and efficient means for quickly formulating alternative future scenarios and running them on computer.
- Model display and interpretation software system, to assist users in displaying output results, using advanced display and visualization capabilities, and interpreting the obtained conclusions to the policy-maker.

Finally, knowledge base DSS generally uses rule-based systems with expert explanation capabilities as the tool for decision support [5,9].

D.4. Electronic-Governance and Decision Support:

A government socioeconomic DSS is generally supported by an overall computing infrastructure depending on the technology of electronic-government, or simply e-governance. In Principle, government decision support functions represent a component of the e-government system, and they benefit from its advanced information and communication technology [ICT].

Most developing countries [DC] governments have been using information technology [IT] for more than 40 years. So what is new about e-government (or e-governance)? In fact, the main contribution of e-government is essentially to move on from IT to the new concept of Information and Communication Technology [ICT]. Based on this concept, computer support to government activities is changing from automating the internal workings of government by processing data to supporting and transforming the external workings of governance by both processing and communicating data [8,14,31].

E-governance offers, then, a new way forward to improve government processes, establish appropriate linkages with citizens, build interactions with civil society, and finally, interact properly with the outside world. According to this concept, e-government uses the ICT to offer three basic change potentials for good governance in developing countries [14,15].

1) Automation: replacing current human-executed processes involving information storage, processing, and transmitting (automation of existing clerical functions).
2) Informatisation: supporting current human-executed information processing (support of the current process of decision-making and decision implementation).
3) Transformation: creating new ICT-executed information processes (for example, creating new methods of public service delivery to households and non-government institutions).

Based on this rationale, the three main contributions of e-governance are:

1. Improving government processes (e-administration)
2. Connecting citizens or household sector (e-citizens)
3. Building external interactions with private business and community services (e-society).

In order to account for the new global environment of the twenty-first Century, it is perhaps important to add a new objective: to establish appropriate linkages with the outside world (say, e-world).

E. Government Socioeconomic DSS in Arab Countries

In this section, alternative models or applications of government socioeconomic DSS in the Arab countries are reviewed and evaluated. The section begins with the special purpose applications of government DSS and then, with the more elaborated and comprehensive general purpose DSS.

E.1. Special Purpose Government DSS:

In many circumstances government senior officials or socioeconomic policy-analysts are faced with a specific problem that needs a quick decision. In this situation, the DSS group needs to concentrate only on developing a simple analytical database along with its particular quantitative decision support tool or model. These tools can, then, be integrated and implemented using a Database Management System [DBMS], a modeling or general purpose programming language and a simple transparent and friendly interface system. Some selected applications of this DSS category in the Arab countries, along with their advantages, limitations, and possible impact are presented below.

Illustrative Case # 1: Foreign Exchange Rate Policy in Egypt

One of the major concerns confronting Egyptian decision-makers is the determination and impact of foreign exchange rate policy. Egypt is accustomed to facing shortages in the foreign exchange with negative impacts on growth and balance of payments. Accordingly, the government of Egypt adopted an economic policy directed to promote exports, rationalize imports, and apply a flexible foreign exchange rate system. Since the outcome from these export-oriented measures is only felt in the medium-term, the Central Bank of Egypt [CBE] needs to make short-term adjustments in the foreign exchange market, via a devaluation policy of the Egyptian pound against the US dollar, and the liquidation of part of its foreign reserves in order to increase the supply of foreign currency.

In the beginning of 2003, the Egyptian government decided to apply a floating foreign exchange rate policy in order to cross the gap between the price of the dollar in the official banking system and that in the black market. In order to identify the macro

impact of this devaluation policy of the Egyptian pound, the Minister of Planning requested a research group in Cairo University to develop a decision support tool, specific to this problem. A problem–oriented DSS was then constructed in order to conduct various foreign exchange policy experiments and assess their socioeconomic repercussions. The computer-based DSS was composed of the following components:

1) A consistent accounting framework particularly assembled to capture the complete cycle of income flows within the economy, as articulated in a Social Accounting Matrix [SAM] for the fiscal year 2001/2002.
2) A model-base consisting of an economy-wide model particularly designed to test the impact of changes in foreign exchange rate on the short and medium-term performance of the economy as a whole.
3) An advanced computer modeling language to implement the suggested mathematical model and provide the appropriate solver. The selected tool was the General Algebraic Modeling System or simply the GAMS software [6].
4) A friendly user-interface system directed to making policy experiments as friendly and transparent as possible.

The DSS was successfully used to estimate the short and medium-term impact of the adopted devaluation policy on principal aggregates of national income and expenditure accounts.

Impact of DSS:

The model-based DSS has successfully supported the urgent request of the Minister of Planning to assess the direct and indirect impact of the foreign exchange rate policy on the whole economy. Moreover, the economy-wide impact provided the necessary background to formulate appropriate complementary policy measures in order to reduce the negative effects of the adopted devaluation program. The DSS also contributed to the process of updating the projections of the fifth medium-term socioeconomic development plan up to 2007, in light of the newly adopted exchange rate devaluation policy. Despite the usefulness of this DSS in policy formulation and testing, it suffers from being a specific system for addressing a particular problem. It should be noted here, that the loss of generality (or flexibility) in this system is nonetheless, remunerated by the small development and implementation costs, as compared with other general DSS.

Illustrative Case # 2: Economy-Wide Loss from the Second Gulf War:

A second significant problem-oriented DSS is concerned with the estimation of the economy-wide indirect loss, resulting from the invasion of Kuwait in August 1990. In 1993, the Kuwaiti government, represented by the Public Authority for Assessment of Compensations resulting from the Iraqi invasion [PAAC], requested from Kuwait University an estimate of the direct and indirect losses resulting from the Iraqi aggression, as background information to be submitted to the United Nations compensation committee [UNCC].

As part of this analytical study, a decision support tool was constructed in order to capture the economy-wide impact of this war. This problem-specific DSS comprised the following computer-based sub-system [21,32]:

1. An economy-wide database consisting of two components, (i) a consistent accounting matrix representing the structure and normal performance of the Kuwait economy before the invasion (the 1989 year was selected for this purpose), and (ii) a time-series macro-economic data estimated for the period (1980 – 1992).
2. An aggregate dynamic computable general equilibrium model to estimate the current and future path of the Kuwaiti economy under alternative scenarios for the period (1990 – 2000).
3. Scenario formulation routines: in order to reach a reliable estimate of the dynamic loss in most economic aggregates, the project team formulated two alternative scenarios; the first assumes that the Iraqi invasion did not happen, (no-invasion scenario); and the second one reflects the performance of the economy during the war and thereafter, till reaching the normal conditions of the economy as measured by the pre-invasion GDP (invasion scenario).
4. Two software systems designed to manage the database of the study and construct the computable general equilibrium model. In particular, an economy-wide modeling software system, entitled HERCULES, was used to implement the CGE model. HERCULES is a software system designed to generate appropriate model structure, arrange its equations, and solve it for the specified projection period [16].

Impact of DSS:

The outcome of the war damage assessment study, which relied on a number of DSS analytical tools, provided very useful background information to the Kuwaiti government during its negotiation with the United Nations Compensation Committee [UNCC], thus enabling it to determine the magnitude of the losses claimable from Iraq. The DSS tool succeeded also in tracing the behavior of the Kuwaiti economy during the invasion period (1990-1991) and thereafter up to 2000, based on alternative scenarios.

Illustrative Case # 3: Development Planning Scenarios in Egypt:

Despite the successful application of the Economic Reform and Structural Adjustment Program [ERSAP] during the 1990s, Egypt is still suffering from a slowdown in the economic activity, a shortage in foreign exchange earnings, structural imbalances in the labor market, a relatively high rate of unemployment, and a growing government deficit. Against this rather bleak economic backdrop, the Egyptian government formulated a medium-term socioeconomic development plan (2002-2007).The plan clearly identified the structural problems facing Egypt and adopted a set of policy measures directed to enhance economic growth and restore external balance.

In September 2001, the Minister of Planning requested a decision support tool for formulating, testing, and supporting the fifth five-year socioeconomic plan. Since the technical team of the plan needed to evaluate alternative developmental scenarios and assess their economy-wide medium-term effects, the main decision support tool was built around a dynamic issue-oriented Computable General Equilibrium [CGE] model [19].

To achieve the required analytical purpose of the study, the DSS consisted of the following components:

1. An aggregate accounting framework for the Egyptian economy constructed around the base year 2001/2002. It comprised a social accounting matrix that captured the structural features and linkages within the economy, labor supply and demand figures in thousands, as well as disaggregated sources and uses of public funds.
2. A Computable General Equilibrium model [CGE] that included both "structuralist" and "neoclassical" elements in its model closure. The "structuralist" approach has the institutional structure of the economy as its point of departure. On the other hand, the model comprises a number of neoclassical aspects such as market clearing output prices and imperfect substitution among imports and domestic goods.
3. Alternative development scenarios, reflecting the development priorities of the plan and the structural problems facing the Egyptian economy. Three development scenarios were formulated and tested using the constructed model. The first, entitled the "laissez-faire scenario", assumed the continuation of the economic policies and development trends applied during the 1990 decade. The second "economic growth scenario" was geared to achieve the required maximized levels of economic growth. Finally, the last "external balance scenario" was directed to restore external balance and eliminate the current deficit of the balance of payments.
4. A friendly, computerized user-interface system based on the On-Line Analytical Process [OLAP]. The purpose of this software system is to generate appropriate economic indicators and reports in an ad hoc and dynamic manner.

Impact of DSS:

Without this economy-wide DSS, it would be extremely difficult, or even impossible, to trace the direct and indirect effects of alternative development scenarios facing Egypt. The formulation and comparison of alternative development options provided very useful insights to policy-makers and planning specialists. In fact, the Minister of Planning and his experts became more confident about the projections of the plan and requested the use of this DSS modeling tool, not only in the plan formulation process, but also during its follow-up exercise. Despite this successful implementation of the DSS modeling tool, its maintenance and continuous updating is receiving less attention from government senior managers.

Illustrative Case # 4: Fiscal Reform Program in Kuwait:

To eliminate budget deficit and restore public sector assets held abroad, the Kuwaiti government formulated two successive five year plans (1995-2000 and 2000-2005) and endorsed, in 1999, a comprehensive fiscal reform program mainly directed to diversify government income and control public spending.

In February 1999, The Minister of Planning asked the Faculty of Administrative Sciences of Kuwait University [KU] to prepare a policy-oriented study in order to evaluate the impact of these suggested fiscal reform policies on the economy up to 2005. To capture economic multiplier effects of Kuwait's fiscal program, an advanced analytical tool (or a model) was needed. Accordingly, a computer-based DSS comprising public finance and economy-wide databases, a computational model, a computer modeling language, and a simple user-interface system was developed [22].

Based on the above arrangement the DSS consisted of the following tools:

(i) A comprehensive database for the Kuwaiti public finance and economy-wide systems. The central part of the database consists of the base year Social Accounting Matrix [SAM)]. The SAM is linked with the detailed accounts of the financial statements produced by the Kuwaiti government. (ii) An integrated public finance issue-oriented dynamic economy-wide interaction model. This "Micro-Macro" approach permits to capture, on the one hand, the detailed performance of the public finance sector and identify, on the other hand, the linkages and economic interactions in a more consistent and transparent way (see Khorshid [22, 24]). (iii) A High-level Economic Representation for Creating and Using Large Economy-wide Systems [HERCULES] was used as the analytical software tool for the DSS. HERCULES represents a high-level computer language intended to formulate, test, and solve large-scale economy-wide models based on the social accounting matrix principles [16]. (iv) A simple, friendly, user-interface to permit formulating alternative input scenarios to the model, and displaying the obtained results in a consistent way.

Impact of DSS:

The analytical results obtained from the DSS were extensively discussed with MOP officials and representatives from the Ministry of Finance in order to adjust the adopted fiscal policies in light of their expected implication on the economy. Furthermore, the medium-term projections generated from the modeling tools of the DSS represented later, on the basis for formulating and testing the socioeconomic development plan (2000-2005).

Illustrative Case # 5: External Debt Management System:

In its massive effort to reform and restructure the economy during the 1980s, Egypt has accumulated a foreign debt of around US$ 45 billion, with more than 5,000 loans in type.

Servicing this large number of loans involves managing payment schedules, renegotiation of terms and interest rates, and monitoring transactions with a large number of creditor countries, banks, and international agencies.

Previous to the development of the DSS, decision or renegotiation on a loan payment was done on a case-by-case basis. Data related to each loan was fragmented. Accordingly, global debt management was not possible, and accurate estimates of aggregate debt portfolio figures were unknown.

To overcome these difficulties and provide effective support for debt management problem, a joint IS/DSS project with the Central Bank of Egypt [CBE] was established. The project comprised two main purposes:(i) To centralize and computerize all foreign debt data in CBE, and (ii) To develop a computer-aided management tool to support and facilitate the registration, control, and analysis of foreign debt (Debt Management and Financial Analysis System).

The comprehensive IS/DSS project was developed over 18 months and it included the following software tools and capabilities [13]:

- A complete debt-validation database for government loans.
- A transaction processing system for debt management.
- A DSS capability to investigate the impact of different scenarios.

The project experienced technical difficulties including:(a) difficulty to maintain and manage the loans database, especially with dispersed negotiation for 5,000 loans;(b) spaghetti code and inadequate documentation of the previous software programs; and (c) difficulty to re-engineer the old classic transaction processing with off-the-shelf mainframe software.

Impact of DSS:

Technical performance problems, while frustrating, did not hinder the strategic gain from the debt management DSS. Rescheduling negotiations with fourteen countries have been smoothly managed because of the efficient and convincing information support (such as quick assessment of alternatives) made available to negotiators. In fact, the major strategic impact of DSS was that loans are now, viewed as part of a dynamic, integrated portfolio, rather than being managed on an isolated case-by-case basis.

Illustrative Case # 6: Customs Tariff Policy Formulation:

For many years the Egyptian government was involved in the formulation of a complex tariff structure. This effort had evolved into initial agreement on a formulation of three broad reform objectives: (a) To develop a homogeneous and consistent tariff structure, (b) To increase revenue to the treasury, and (c) To minimize the impact on low-income groups. In January 1986, a “new customs program” was announced in its pre-final form.

Despite initial agreement and good intentions, inter-ministerial debates and conflicts about policy forms and perceived economy-wide impacts grew.

After months of discussion, in June 1986, the Cabinet of Ministers requested the assistance of IDSC in this matter. Accordingly, a joint team of IDSC and the Ministry of Finance [MOF] developed an initial DSS model using the already announced tariff-reform proposal [12,18]. The team comprised 32 persons: two IDSC managers, two under-secretaries, six builder/implementers, and 22 data entry/validation personnel. Data was collected, albeit with difficulty, from fragmented sources. During the progress of the project, the team carried out continuous discussions with the six most impacted ministries and met with senior policy-makers to gather feedback and build consensus.

Impact of DSS:

Initially, conflicts were sharp, discussions were heated and one-sided theories prevailed. However, as the model became more representative through the prototyping effort, the impact of various "what if" scenarios, reflecting alternative tariff rates, was demonstrated with numbers rather than abstract opinions. The focus gradually moved from objection to constructive input. After one month of intense effort, a consensus was reached and a new customs tariff policy was in place. In addition, the developed customs tariff policy DSS has proved to be an excellent negotiation tool in support of this government decision-making process. In fact, the customs tariff DSS facilitated the group decision-making exercise by reducing conflict and promoting consensus through clarifying the trade-offs and potential impacts of alternative tariff structures on the whole economy and on its sectors. Furthermore, the DSS provided more realistic quantitative estimates of the expected increase in government revenues due to the new customs tariff program.

E.1.1. Summary:

To sum up, special purpose DSS can represent a very useful tool for addressing a specific problem or supporting a particular decision. Since these DSS tools generally tend to concentrate on relatively small size problems, they are, consequently, less expensive than general purpose DSS. This DSS category builds on the specific nature of the problem under consideration to achieve more realistic and applicable solutions. They suffer, however, from a number of limitations. (i) These tools are designed to handle a specific problem or a particular situation; they are not therefore, adaptable to other applications. (ii) In many circumstances, both the structure and components of the special purpose DSS are influenced by the particular interest of the DSS developer. (iii) The fragmented character of this DSS type might lead, in some cases, to neglecting the impact of important factors that might affect output. (iv) The special purpose application coupled with the tendency to keep the cost as low as possible, might contribute to limit the benefits from the recent advances in information and communication technology.

E.2. General Purpose Integrated Government DSS:

As indicated in section (D), General purpose or Integrated DSS is not particularly designed for specific application, problem or issues. It provides general software capabilities that can fit several decisions using alternative analytical tools or models. This DSS category can have, nonetheless, different orientations or trends. Accordingly, they are divided into data-centered, model-centered and knowledge-centered DSS. The purpose of the first category is to manipulate an analytical database (or data warehouse) using the OLAP software technology. The second category relies on models and Model-Based Management System [MBMS] to support the decision-making process. Finally, the last category relies on knowledge processing, reasoning and expertise to support decision.

Based on the outcome of the review carried out on DSS applications in the Arab countries, the use of this second comprehensive type to support government socioeconomic decisions is very limited. A direct reason for this situation is the considerable expenses associated with the development, maintenance and updating of these general-purpose DSS systems. A second reason comes from the fact that DSS understanding and acceptance by government senior managers and public sector policy-makers is still very limited. Finally, the small number of specialists of DSS in the Arab world contributes, also, to limiting its utilization in the region.

This section aims to introduce and assess the two most representative and successful government DSS experiences in the Arab countries: the Development Planning Decision Support project [DPSS] of the Ministry of Planning in Kuwait and the Information and Decision Support Center [IDSC] of the government of Egypt. The Kuwaiti DSS represented a joint project carried out by the Ministry of Planning [MOP], the Department of Economic and Social Affairs [DESA] of the United Nations, and the UNDP. The Cabinet of Ministers of the Egyptian government, however, initiated the second DSS. With respect to the use of analytical tools and models, the Kuwaiti case is more advanced. It integrates the data-centered and the model-centered DSS technologies into a unified computer-based support system. Nonetheless, IDSC provides many lessons about the institutional aspects of the DSS and its computing infrastructure.

E.2.1. Kuwait's Computer-Based Development Planning Support System:

Because this DSS was mainly designed to support the development planning process in Kuwait, it was called " Development Planning Support System" or simply computer-based DPSS. The Kuwaiti DPSS system was extensively experimented and used to support the formulation of medium-term socioeconomic development plans and it formed, as well, the analytical base for carrying out a successful set of policy-oriented background studies. The projections of the medium-term plan (1995-2000) were completely based on the economy-wide models incorporated in the DPSS [23,25].

E.2.1.1. Main Features of Kuwait's DSS:

The construction and utilization of the Kuwaiti DPSS was governed by a number of specific features and capabilities that can be broadly divided into socioeconomic features and computer-based technical characteristics. On the socioeconomic side, the DSS was based on two principal features: first, as a general purpose DSS, the design and utilization of the Kuwaiti DSS was governed by a comprehensive set of socioeconomic development issues. Hence, the retrieval of a particular indicator or the selection of a specific model is governed by the issue of interest as defined by the decision-maker. This also implies that the database includes an issue-based catalogue that provides linkages between the data elements and the corresponding issues of interest. Second, the developed government DSS concentrated mainly on economy-wide analyses supported by a comprehensive set of socioeconomic planning and sector-specific issues reflecting current and future interests of Kuwaiti policy-makers. The analytical database, on the economy-wide level, adopts the Social Accounting Matrix [SAM] principles and methodology, to organize information reflecting the structure of the economy. Using the analytical database of the DSS, decision-makers can assemble alternative issue-oriented SAMs of the economy in a friendly and efficient way. These SAMs can then be used to constitute the database of an economy-wide simulation model.

From a technical viewpoint, the development and utilization of the Kuwaiti DSS is based on the following characteristics: First, the DSS includes both the data-centered and model-centered features (explained in section D). On the database side, the Kuwaiti DSS adopts a technology similar to the On-Line Analytical Process [OLAP], in order to construct ad hoc reports and apply simple computational techniques. On the modeling side, the DSS relies on a model-base, incorporating economy-wide and sector-specific models, and a model-base management system to manipulate the stored models. Second, the General Algebraic Modeling System [GAMS] is used as the main modeling development tool for socioeconomic optimization and simulation models [6]. The GAMS software is selected due to its extensive application in socioeconomic analytical studies. Third, the DSS includes a set of model management tools intended to: (a) screen the set of models in the model-base and explain their basic characteristics to the user, (b) select an appropriate model, based on a set of user-defined requests, (c) formulate alternative input scenarios to be tested by the selected model, (d) execute or run the model using GAMS solvers, and finally, (e) display and interpret the obtained results. Fourth, the Kuwaiti DSS system interface was developed in Arabic to improve its communication means with end-users.

E.2.1.2. Institutional Aspects of the DPSS:

Since the DPSS was developed to support the socioeconomic planning activities, it is, therefore, only natural for it to be located in the Ministry of Planning [MOP]. The DPSS has proved, however, to be extremely useful in supporting other policy-oriented studies, requested by other government agencies and decision-makers. The DPSS represents, therefore, a more general tool for supporting the governmental request for socioeconomic

information services. The list of beneficiaries included the Ministry of Finance, the Ministry of Administrative Development, Kuwait University, the Cabinet of Ministers and the Supreme Planning Council [SPC].

From an organizational point of view, DPSS is updated and maintained by a team composed of IT experts and economists resident at the MOP. More than 80 percent of the data needed for the DPSS is provided by the Statistics and Information Sector of the MOP, which produces and disseminates national accounting data, population and labor surveys, households budget surveys, government finance statistics, foreign trade bulletins, and the annual establishment surveys. Government institutions such as the Central Bank of Kuwait, the Ministry of Finance, and Kuwait Investment Authority secure additional data.

It should be noted that the DPSS was based on extensive efforts and accumulated experience gained from a long-term research project jointly carried out by the MOP and Kuwait Institute for Scientific Research [KISR]. This project has successfully established the technical base for constructing the required socioeconomic accounting systems and policy-oriented analytical models. The DPSS project team has also organized formal and on-the-job training courses for data experts, economists, and planning specialists in the MOP to allow for a more effective utilization of this government socioeconomic computer-based system.

E.2.1.3. Challenges, Problems, and Learned Lessons:

Despite the large effort invested in the construction, implementation, and successful application of the DPSS, as well as in the complete on-the-job training courses, comprehensive maintenance and updating programs need to be carefully designed to ensure the sustainability of benefits obtained from this government socioeconomic computer-based support system. This represents an urgent activity to be considered by the Kuwaiti government.

Since most socioeconomic and development planning information was produced and disseminated by the central statistical office of the MOP, this represented an important factor that significantly contributed to the successful implementation of the DSS project. Furthermore, the responsibility of the MOP to formulate and follow-up long and medium- term plans has also created political pressure to finalize the technical work and use it in the development of socioeconomic plans. In fact, the DPSS represented the main analytical supporting tool to build the socioeconomic accounting framework of the 1995-2000 medium-term plan and test alternative development options and policies.

Despite this considerable success, the project team faced a number of barriers, challenges, and learned practical lessons. They can be summarized as follows:

- First, there was the language barrier for the utilization of the computer-aided DPSS system by the employees and specialists of the MOP and other

government agencies. To overcome this difficulty, a comprehensive Arabic language interface was implemented to isolate users from the programming languages and database management systems, which need to be addressed in English language syntax.

- The multidisciplinary nature of the team involved in the socioeconomic planning process. The plan-formulation team consists generally of national accounting data experts, economic analysts, demographic specialist, planning advisors and policy-makers from the MOP and the Supreme Planning Council [SPC]. To deal with this difficulty, a multi-level on the-job-training course was designed and implemented.
- The computerized DPSS has represented a very useful tool, not only during the plan formulation process, but also during the discussions with the representatives of the Supreme Planning Council [SPC] for the endorsement of the plan. In this respect, DPSS was used, as a powerful negotiation tool, to generate appropriate ad hoc reports and test additional policy measures requested by the SPC.
- After its intensive use in the development planning exercise, other government agencies, namely Kuwait University [KU] and the Ministry of Finance [MOF], have also successfully benefited from some modeling components of the DPSS.
- During the starting phase of the DPSS project, a number of planning specialists and policy-makers questioned the feasibility and success chances of this comprehensive computer-aided planning tool. The project advisory committee decided, therefore, to begin with a small-size pilot project, in order to prove the concept and feasibility of such a comprehensive decision support tool before its full implementation. This has represented an important factor that contributed to the project's acceptance by all concerned government institutions.

E.2.2. Egypt's Information and Decision Support Center:

The first DSS center to be established in the Arab countries was the Information and Decision Support Center [IDSC] of the Egyptian Cabinet of Ministers. This leading experience has played a significant role in promoting and disseminating government DSS concepts and applications in the Arab world. Despite deviation from the original objectives, no other Arab country has succeeded in achieving its comprehensive role and institutional linkages. Several publications –both international and domestic– are available to describe its structural and organizational features, as well as the lessons learned from this experience. The center was originally established in 1985 as the central information and decision support unit for the Egyptian government. The creation of a Ministry for Communication and Information in 1998 resulted, however, in redefining and reorienting IDSC's objectives and mandate.

E.2.2.1. Main Purpose and Objectives:

Since its inception in 1985, IDSC's main mandate was to contribute to the achievement of economic, social, and administrative development in Egypt, via the efficient and effective utilization of the appropriate information technology. More specifically [18]:

- Developing information and Decision Support Systems for the Cabinet and top policy-makers in Egypt.
- Supporting the establishment of Decision Support Systems/centers in different ministries and making more efficient use of available information resources.
- Encouraging, supporting, and initiating informatics projects that would accelerate the development of Egyptian ministries, economic sectors, and governorates.
- Participating in international cooperation activities in the areas of information and decision support.

E.2.2.2. IDSC's Organizational Structure:

To support the achievement of its strategic objectives, IDSC includes special teams for crisis management, priority assessment, and quality control to prioritize strategic socioeconomic issues in the Cabinet agenda with the objectives of developing both high quality information and decision support services. The technical work is ensured via five departments. Project Development Department, which responds to the IT needs of different ministries and governorates; Information Resource Management Department, which responds to different user needs with respect to systems design, development, installation and maintenance; Human Resource Development Department, which deals with the training of IDSC staff as well as the staff of various organizations with which IDSC has joint projects; Finance and Administration Department, which deals with financial, administrative and legislative issues, regarding both internal and external operations; and finally, a Decision Support Department concerned with information and decision support requests from various ministries, governorates, and other local organizations. The role of this focal department is to identify user needs, formulate issues, define information and decision support requirements, and identify possible solutions to the selected issues.

As a result of establishing a Ministry for Communications and Information in 1998, the new director of IDSC modified the organizational structure to establish two new departments. The first one is concerned with economic analysis, and the second is directed to promote socioeconomic development projects.

E.2.2.3. Socioeconomic Development Projects:

In the seventeen years that followed its foundation in 1985, IDSC has accumulated a long list of IT projects to support the Egyptian Government. Despite their usefulness in the policy-making process, these projects are, however, fragmented in nature due to unorganized requests from governmental units. These segmented projects have,

nonetheless, established the experience and knowledge needed to begin more comprehensive decision support tools, such as the Kuwaiti DPSS. It should be noted also that these projects are consistent with the issue-oriented DSS approach, adopted by IDSC senior managers, and articulated in the paper by El Sherif and El Sawy [13] in 1988. Given the dispersed nature of IDSC applications (IS, IT and DSS projects), it is more relevant to concentrate in this paper on the DSS applications, per se. Examples of these applications were described in section (E.1). However, interested readers can refer to the IDSC website address www.idsc.gov.eg and the published papers [12,13,18] for additional information. The DSS issue-oriented projects include the following:

- Early warning system for the Egyptian economy
- National center for crises management
- Electricity Decision Support System
- Budget Deficit analytical support system
- Debt Management Decision Support System
- Customs tariff policy formulation system
- Ministry of Planning support system, and
- A set of development projects such as balance of payments deficit, export promotion, unemployment database, and poverty alleviation.

E.2.2.4. IDSC Issue-Based Management Approach:

One main contribution of the IDSC, on the conceptual level, is the introduction of the issue-oriented DSS management approach to the region. In general, IDSC has adopted a two-phase approach for the implementation and institutionalization of its issue-based Decision Support Systems projects. According to Kamel [18], the first phase (implementation), is concerned with the realization of Decision Support Systems, and includes a particular focus on model building. The second phase (institutionalization), is concerned with embedding the DSS into their organizational contexts, and includes a particular focus on management.

The experience of IDSC in developing Decision Support Systems suggests that institutionalization is a complementary and integrated process that accompanies system development, design, and implementation. Institutionalization is considered then, to be as important as the analytical and software tools of the DSS.

E.2.2.5. Challenges, Problems and Learned Lesson:

Based on the implementation of several projects directed to develop and diffuse Decision Support Systems for socioeconomic development in Egypt, the following challenges can be summarized [18]:

- The efficient and effective utilization of scarce resources
- The ill-structured nature of government strategic decision-support process

- The changing, turbulent, and dynamic environment of government decision-making
- The crisis-management mode of operation in most strategic socioeconomic decisions of the public sector
- The need for conflict resolution in strategic decision-making
- The availability of DSS tools and generators relevant to different sectors and applications

Finally, El Sherif, El Sawy and Kamel [12,13,18] summarized the set of lessons learned from applying various government DSS in the following points:

1. Structuring of decision-related issues is an integral part of the design and implementation of Decision Support Systems dealing with socioeconomic development on the national level.
2. Developing a Decision Support System to address one specific socioeconomic issue might affect other issues, which should be taken into consideration during the design phase, in order to save time and effort.
3. Given the urgent and critical nature of government socioeconomic decisions, DSS design should allow for a crisis management mode of operation. Response to crises' requests, generally entails the formation of crisis teams with managerial and technical support, capable of operating in such situations.
4. An effective DSS depends on the availability and accessibility of timely, relevant, and accurate information.
5. Successful implementation of Decision Support Systems is a necessary but not sufficient condition for the successful institutionalization of DSS. Both implementation and institutionalization processes should be well integrated.
6. While successful implementation requires top management support, successful institutionalization requires even broader organizational support.
7. Continuous, multi-level training of human resources is a critical factor in the successful adoption, adaptation and dissemination of DSS within government institutions.

E.2.3. Concluding Remark:

IDSC reflects a number of basic differences when compared with the DPSS of Kuwait as a general-purpose tool. First, the IDSC was established as a government agency closely related to the Cabinet of Ministers. It has the clear objective of supporting the strategic decisions of the Cabinet, with an emphasis on socioeconomic development issues. Second, given its central location, IDSC has more flexibility to deal with decisions of other ministries and government agencies than the Kuwaiti DPSS. Third, IDSC approach to support decision-making is based on tackling and managing government decisions by concentrating on each issue or problem in a separate manner. It does not, therefore, include an integrated framework for organizing data, analytical tools, problems and issues, such as the case of the DPSS. IDSC has, however, the credit of introducing the new concept of issue-based DSS for managing socioeconomic decisions. Fourth, IDSC

falls short in developing and using quantitative models as an important decision support tool compared to the Kuwaiti DPSS. Fifth, IDSC succeeded during the 1980s and the beginning of the 1990s in spreading out the Egyptian computing infrastructure, to reach most government agencies and provinces. Although this activity is not considered as an integral part of the DSS tasks, it has, nonetheless, positively contributed to the successful application and dissemination of the DSS concepts and methods.

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Decision Explorer: www.banxia.com
Idecide: www.decisivetools.com
Impact Explorer: www.banxia.com
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IDSC Egypt: www.idsc.gov.eg