

AN APPROACH TO MODELLING MULTI-AGENCIES NETWORK TO SUPPORT THE DEVELOPMENT OF ELECTRONIC GOVERNMENT APPLICATIONS: MALAYSIAN EXPERIENCES

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Abstract

Many problems in economic and social development need to be solved by complex policies. The implementation of such policies needs collaborative action of a number of agencies. In this respect interrelationships in the network of these agencies need to be defined and established. This is important to provide a shared picture of the situation and a basis for coordinated effort between these agencies in the implementation of social and economic development policies. Accordingly an approach needs to be developed to model multi-agencies networks structure. The need for such an approach is not given enough attention (O'Toole, 1997; Metcalfe, 1999; Provan et al, 1995). We proposed an approach based on concepts and methodology developed in systems thinking, in particular viable system model (Beer, 1979), and soft system methodology (Checkland, 1981). In the paper, we will first highlight the need for such an approach. We then briefly introduce viable system model and soft system methodology and described the use in our approach. The application of the approach is discussed in the light of a case study. The paper also discusses how the approach may be used in the development of Electronic Government applications. Malaysia public sector has launched Electronic Government Program in 1997. The objective of the Electronic Government program is to make government to become "network" within itself both in terms of technology and collaboration. Information will flow smoothly across ministries and agencies through a common database and compatible systems inter-linked by secure high-speed network and applications of better analytical tools and decision support tools lead to improved decision making in terms of speed and quality (MAMPU, 1997). In order for EG applications to support the network effectively, a purposive inter relationships between agencies or a network organization need to be defined. In this respect, the approach proposed is important for development of effective Electronic Government (EG) applications. We conclude the paper with current research being carried out and further research that need to be done to enhance the approach.

1. INTRODUCTION

Implementation of complex policies usually requires a collaborative action of a number of agencies. In this respect interrelationships in the network of these agencies need to be defined and established in order to ensure efficient and effective policy implementation. This is important to provide a shared picture of the situation and a basis for coordinated effort between agencies. According to O'Toole (1997), networks are structures of interdependence involving multiple organizations or parts thereof, where one unit is not merely the formal subordinate of the others in some larger hierarchical arrangement. The institutional glue congealing networked ties may include authority bonds, exchange relations, and coalitions based on common interest, all within a single multi-units structures. Management in such environment is regarded as "getting things done through other organizations" (Metcalfe, 1999). Issues of designing multi-agencies networks structures have been discussed in the public administration literature (O'Toole, 1997; Metcalfe, 1999; Provan et al, 1995). A number of approaches to the design of multi-agencies network have been described in the literature. For example approach to designing networks of multi-agencies based on matrix organization, inter-agencies coordination committees or flexible workgroup (O'Toole, 1997). According to O'Toole (1997) these approaches have no comprehensive theory to suggest how to manage such organized effort and less emphasize is given on management capacity building needed to carry out the given roles (Metcalfe, 1999). According to Metcalfe (1999), organizational networks need careful design and deliberate development. A well-understood organizational division of labor with good working relationships is fundamental to the multi-agencies networks structure. The composition and distribution of organizational capacities for managing the whole network and the means of ensuring coordination among the organizations involved make crucial contributions to the performance of integrated regimes. Based on his experiences in Europe, Metcalfe (1999) suggests that management capacity should be given serious attention to ensure effective multi-organization. O'Toole (1997) suggest that the new approach should take into account the many types of relationships that exist in a network such as hierarchical and horizontal relationships.

This paper proposes an approach to the designing of multi-agencies networks structures. The approach is based on the concepts and methodology developed in systems thinking, in particular viable system concepts (Beer, 1981) and soft system methodology (Checkland, 1981, Checkland et al, 1990). The approach represents a synthesis of our experience and findings from a number of action researches that we have carried out in the development of information system planning for public sector applications (Hasmiah Kasimin et al, 1999; 2000).

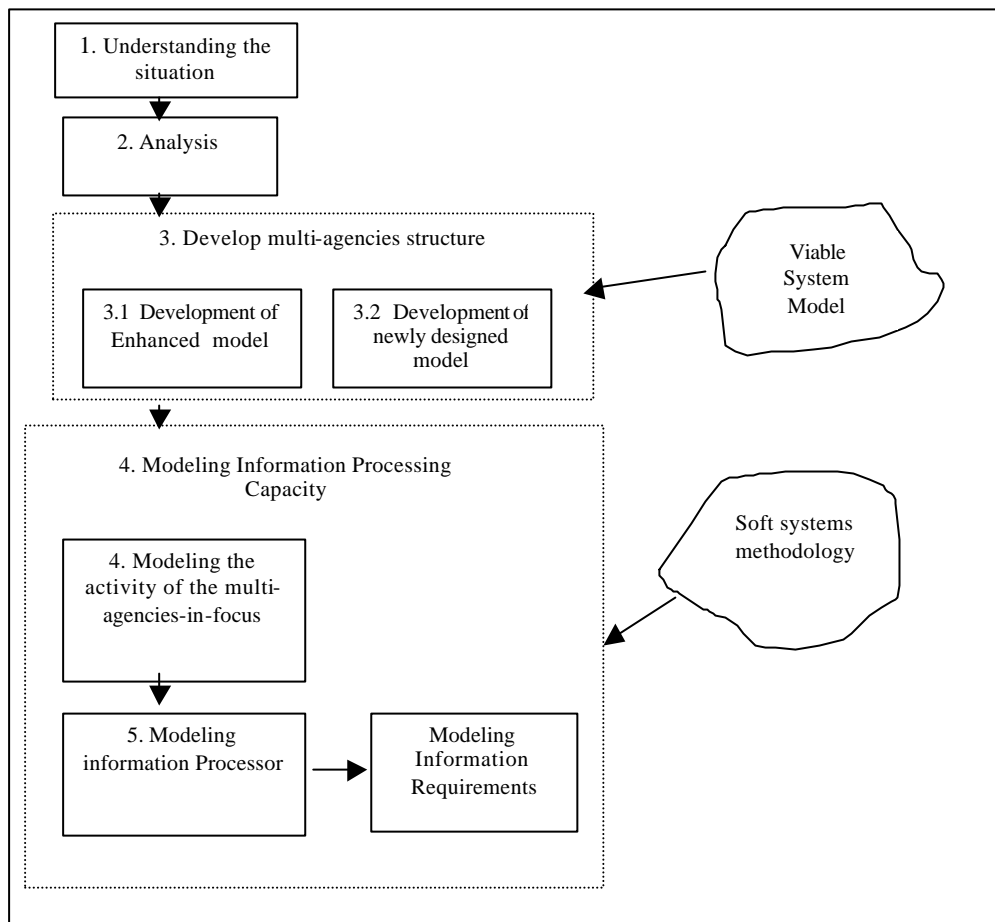


Fig. 1: An approach To Modeling Multi-Agencies Network

2. A SYSTEMIC APPROACH TO MODELING MULTI-AGENCIES NETWORKS

The approach is shown in figure 1. As shown in figure 1 there are two important inputs to the approach: viable system model and soft systems methodology. VSM is developed by Stafford Beer (Beer , 1981; 1989). It was developed based on the logic of cybernetic theory and supported by empirical works (Espejo, R. et al, 1989). A viable system has five basic functions namely, policy, intelligence, control, coordination and implementation. This is shown in figure 2. Policy Function determines the directions and identity of the system. The basic role of Intelligence Function is to scan the environment, structuring problem situations, identify opportunities and threats by taking into account organization's internal capabilities. Ensuring effective and efficient implementation of policy as envisaged by the Policy Function rests with the Control Function. Coordination Function is to coordinate all parts of implementation function. Implementation Function is an important component of viable system. The role of this function is to produce what the system supposed to produce based in its objective. One of the important characteristics of viable system is its recursivity, namely it can be modeled into a number of level. Each level duplicate the structure of the next higher level and the system in each level is a viable system itself. The linkages between the five functions, and the interaction of the system to its environment represents define the multiple regulatory loops. The linkages are important for understanding the system's behavior. Its also define information flows to support the functions of the system.

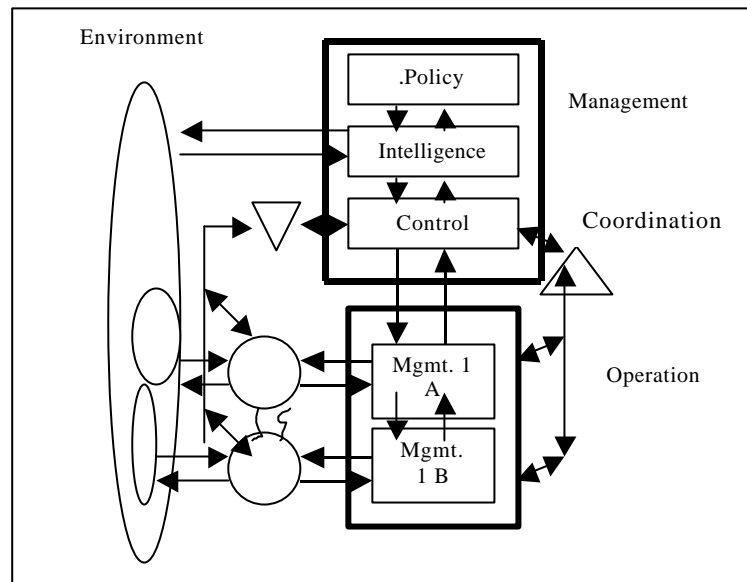


Fig.2 The Viable System

Adapted from Beer.1981

SSM is a systemic approach to problem solving (Checkland, 1981; 1990; Wilson, 1984). SSM approach has a number stages and most importantly: problem structuring, problem definition, root definitions of the relevant systems, conceptual modeling, definition of feasible desirable changes and action to solve or to improve the problem situation. The conceptual models make use of the concept of a human activity system as a means of getting from finding about the situation to taking action to improve the situation. Human activity system is a notional system, which gives guidance for identifying the actual activity to be carried out to achieve the desired objectives. It is a systemic process of enquiry structured around a comparison between a real-world problem situation and conceptual models of relevant systems of purposeful activity.

Stage 1: Understanding the Situation

This stage concerns understanding the problem situation in terms of the policy-in-focus, the objectives of the policy, the target group, and agencies involved. Sources of data and information used at this stage come from reports and management manuals, interviews and discussions with top-level management and officers involved.

Stage 2: Analysis

Analysis of all agencies in terms of organization structure, core activities carried out, functions to be performed, information they use to carry out the core activities and functions, is carried out at this stage. This stage also identifies the structure of the relationship between these organizations in terms of information flows. This analysis helps to diagnose the limitations of the present structure in terms of the existence or otherwise of the important functions and information flows as well as the organizational information processing capacity to carry out the functions and process the information. We defined information processing capacity in terms of **core human activity system**, **core information requirements** and **core information processors** that need to exist in order for the organizations to achieve the objective and have basic characteristics of viability. Accordingly, a proposal will be put to improve the structure and develop the capacity.

Stage 3: Develop the Structure

Using the result of analysis in stage two, VSM is used for modeling multi-agencies-in-focus. Modeling is done either in **improved** or **design mode**. Improved mode is used in the situation where there exists a formal structure that defines the relationship between organizations but some weakness and limitation are identified in relation to its ability to achieve the objective and become a viable structure. In this context VSM is used to improve the structure. Design mode is used in the situation where there exists no formal structure to support the application. We encountered this sort of situation where the application is novel and a number of organizations are deemed to be involved in the applications. In this respect, a new structure needs to be identified. For this situation VSM is used to model and design the new structure.

Stage 4: Modeling Information Processing Capacity

This stage concerns modeling viable human activities system for each major function, namely policy, intelligence, control, coordination and implementation. Soft system methodology is used at this stage to help in modeling the activities. The viable human activities system is used as the basis for identifying information processors and information requirements to support the activities.

3. Application of the Approach

We were commissioned to prepare manpower development Master Plan for a state government. There are a number of important agencies in the state which are involved, directly and indirectly, in the activities related to manpower development. For example State Human Resource Development Council (HRDC), State Human Resource Development Unit (HRDU) under the Chief Minister Department, a number of Federal Agencies such as the Statistics Department, Labor Department, Manpower Department, Immigration Department, Education Department, Public Service Commission (SPA). State agencies such as Youth Training Center, State Foundation, State Skill Development Center, State Timber Company. There was no formal structure that defined the role of these organizations in manpower development. This was due to a number of reasons. For example manpower development is considered as organizational or departmental specific activities by the state government. But comprehensive Master Plan involves a number of related agencies.

As there was no clear formal structure of the inter-agencies relationships to implement the Human Resource Master Plan, VSM was used in designing mode. We analyze all agencies involved in terms of their role and functions in human resource development. For example the State Human Resource Development Council (HRDC) is to determine the directions for human resource development in the state. A number of committees are set up to support the council in carry out its functions. So HRDC and committees are responsible for Policy Function. Intelligence Function is to scan the environment and formulate actions necessary for human resource directions from system five and information on internal capacity from system three. We have identified SPU to be responsible for Intelligent Function. Coordination function is carried out by the HRDU, which is also responsible for carry out Control Function. Implementation function is carried out by a number of programs. They are Entrepreneurial, Youth Training, Support Program, Training Program and Program for Women. Each of the programs is sub system that needs to be developed as a viable system itself. A viable system model for agencies involved in manpower development is shown in Fig 3. Viable system model interacts with environment, which supply the system with useful economic and social information. We have identified a number of useful information categories as shown in Fig 3. We have also identified agencies, which can act as data providers. For example Statistics Department, Labor Department, Manpower Department, Immigration Department, Education Department, Public Service Commissions (SPA).

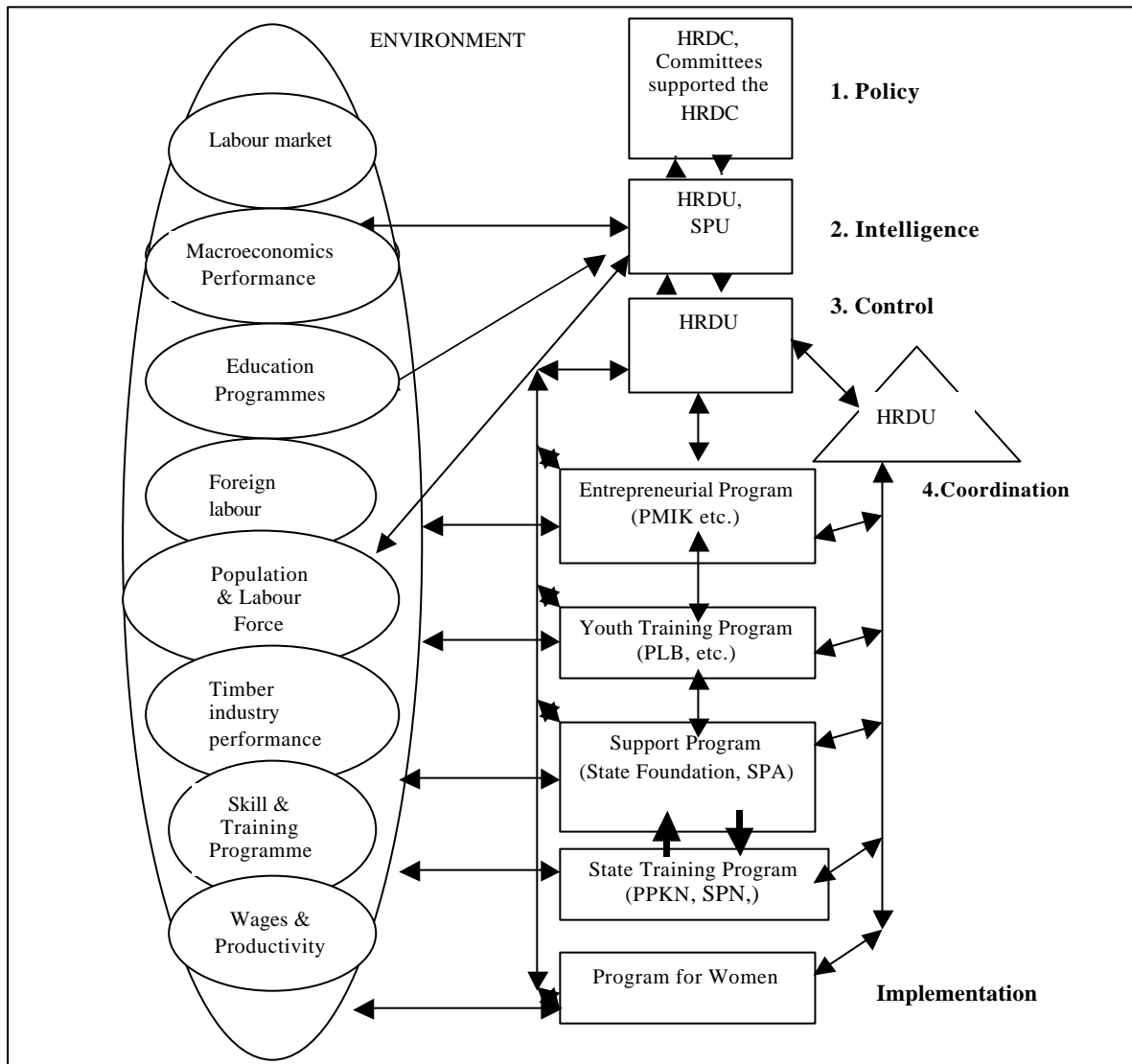


Fig. 3 Proposed Viable Multi-agencies Structure for HRDP

3.2 Modeling Information Processing Capacities

VSM emphasizes the importance of developing management capacity to carry out its main functions. For example Intelligence Function provides the system with feedback information of the environment. It also projects the identity of and message from the organization into its environment. These loops must operate in balance, to avoid either overloading the system with swamp of external research data without the capacity to interpret and act on that data, or the alternative risk of communicating outwards in a strong fashion, without having corresponding means to listen for feedback from the environment. In order to carry out the function effectively, it needs to be supported by information flows from the environment, the control function and the policy function. At the same time the intelligence function also provide information to the control function, policy function and the environment. This implies that the Intelligent Function needs to have information processing capacity to assist it to carry out its function effectively. VSM does not explain how to develop the capacity for each function. In order to define the capacities we use system soft systems methodology, in particular the concept of human activity. For example in this case study we have proposed a human activities system for scanning the environment. This human activities system is useful for Intelligent Function. The proposed Human activities system comprises five sub activities namely, sectoral and regional development analysis, macro development analysis, manpower supply analysis, manpower demand analysis and labor market analysis (Fig. 4).

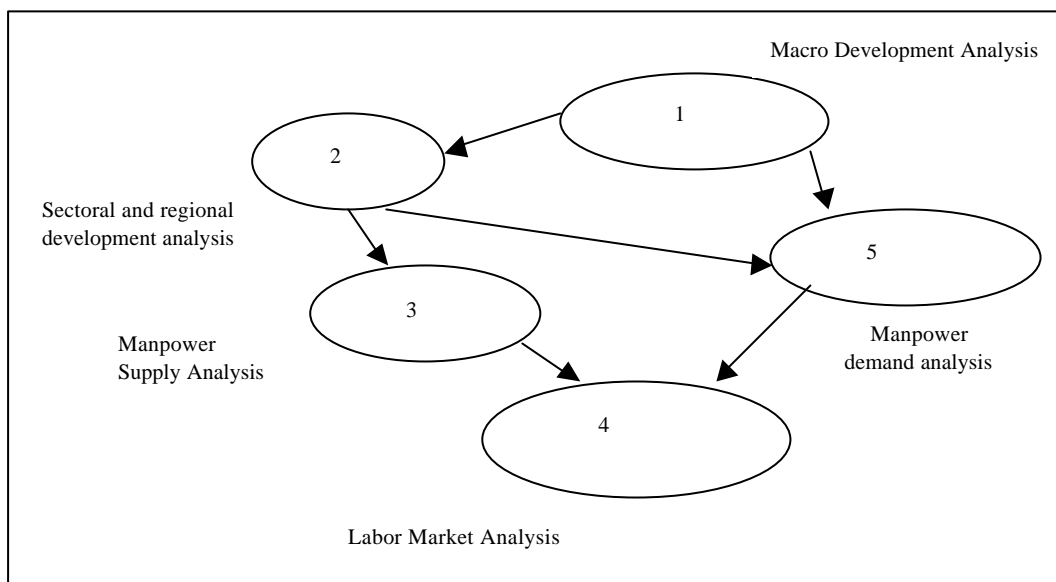


Fig. 4: Human Activities of The Manpower Planning Function

The human activity system proposed becomes a basis for defining information processors and information requirements to support each activity. Viable system model provide guidelines for defining information flows between functions and relevant agencies. Human activity system can be used to identify information requirements and information processors. Example of information processing capacity is shown in the following Table 1. Information system architecture to support information processing capacity of Table I is shown in figure 5.

Table 1: Proposed Information Processors and Information Requirements for Activity Macro Development Analysis

Manpower Planning Activities	Proposed Analysis (Information Processors proposed)	Information Requirements	Present Source of Information
1. Macro Development Analysis	<ul style="list-style-type: none"> Macro development long-term planning: trends, future equilibrium conditions Macroeconomic framework model Time-series forecasting model Financial sector model Sector models 	Expenditure on the gross domestic product at current prices Sarawak; Government revenue and expenditure-Sarawak; Gross domestic Product (constant price); Value-added; Agriculture, livestock and fishing; Forestry and logging; Mining and quarrying; Manufacturing, construction, Services, Government services; Consumption expenditure; Investment expenditure; Export, Import; Change in stock; Wage income; Non-wage income; Indirect tax, Direct tax; Private saving; Transfer payments; Government surplus; Government borrowing; Federal Government Grants(net); Population; World Trade (income); Labor force; Labor force (employment) in economic sectors; Share of sector to GDP; Labor force participation rate	<ul style="list-style-type: none"> Statistics Department

4. Potential Use of The Approach In Developing Electronic Government Applications

Malaysia public sector has launched Electronic Government Program in 1997. Electronic Government program will make government becoming “network” within itself both in terms of technology and collaboration. Information will flow smoothly across ministries and agencies through a common database and compatible systems inter-linked by secure high-speed network. EG lead to the need for better application of analytical and decision support tools to improve decision making in terms of speed and quality (MAMPU, 1997). The EG applications are to assist towards achieving a higher capability of governance through the transformation of inter-agencies processors at the operations, supervisory and policy levels. The new systems address the improvement of communication and information sharing

capabilities, improvement of information capabilities management among agencies, as well as improvement of core operational capabilities and functions of the agencies.

Our approach is useful for defining a purposive inter relationships between agencies and ministries and in particular viable system model help in defining multi-agencies structure as a viable system. SSM helps in defining decision-making activities to be carried out in each function. VSM structure of the multi-agencies, the human activity system, the information requirements and information processors will provide the basis for identifying information system architecture for EG application. Information system architecture is defined in terms of network architecture, application architecture and common data base architecture.

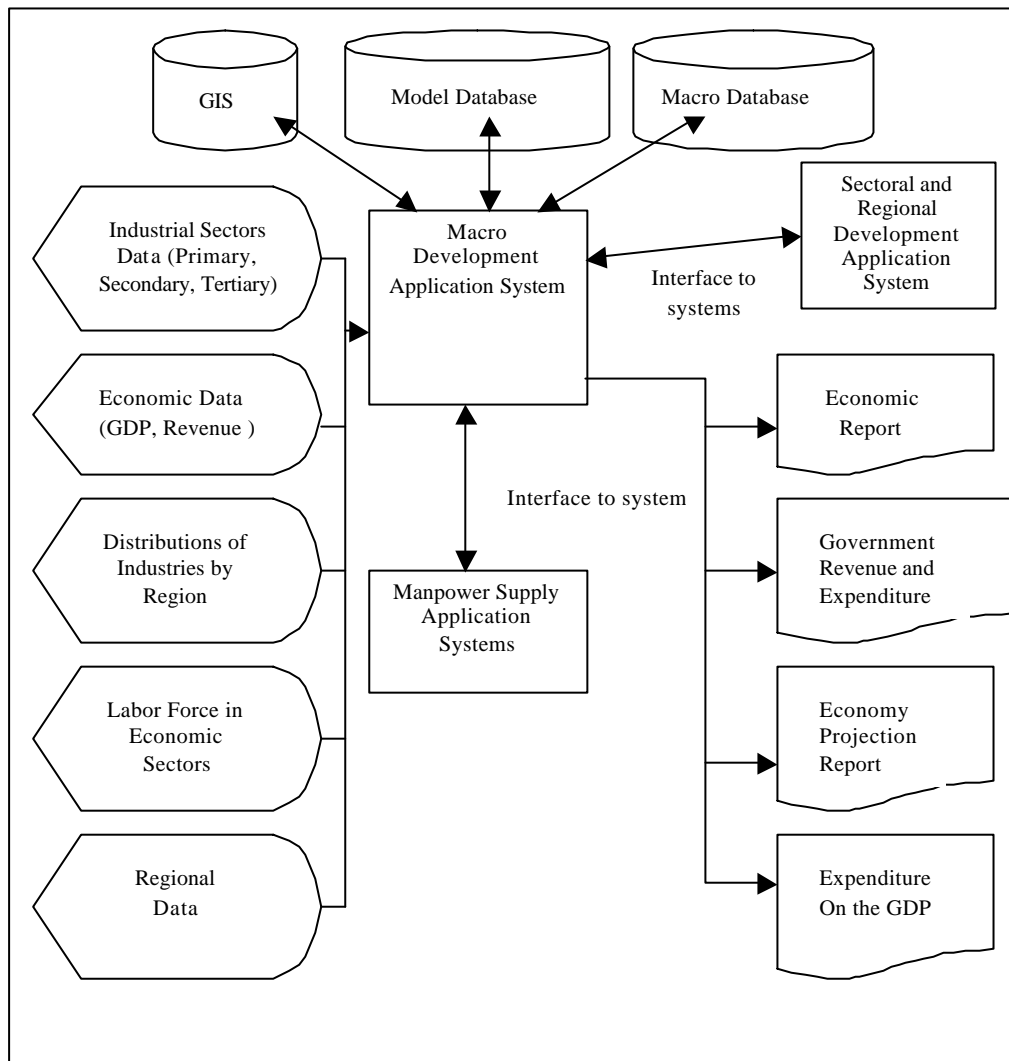


Fig 5: The Architecture of the Macro Development Application System

5. Conclusions

Solving complex social and economic problem normally involves collaborative efforts of many agencies. Understanding and modeling relationship between the agencies, namely the role and function played by each agency, information flow between agencies, is one of the important steps in solving social and economic problems. The proposed approach is useful in understanding and modeling relationship between agencies. It helps to define hierarchical and horizontal relationships between agencies involved. It also emphasizes on developing organization and management capacity in terms of information processing capacity. Currently research is carried out to enhance the approach toward becoming an established approach. This includes the development of tools for modeling Viable Data Architecture.

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