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PLANNING PROCESSES IN DEVELOPING COUNTRIES: TECHNIQUES AND ACHIEVEMENTS

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DEVELOPMENT PERSPECTIVES

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This paper attempts to lend broad general perspectives on modelling in developing countries. The first part of the paper examines the process of planning in terms of a pyramidal structure. The concepts of goals, means, measurement, and value systems are discussed in the light of this paradigm. The second part of the paper briefly reviews the papers comprising this volume and makes comparisons and contrasts.

Machiavelli on Innovators

"It must be remembered that there is nothing more difficult to plan, more doubtful of success, nor more dangerous to manage than the creation of a new system. For the initiator has the enmity of all who would profit by the preservation of the old institutions and merely lukewarm defenders in those who would gain by the new ones."

Niccolo Machiavelli (1469-1527)

1. Introduction

The term "development" has powerful meaning: advancement or progression from a latent, rudimentary, or immature state to a higher and superior level of activity and accomplishment. Clearly implied is the idea of advancement, however perceived and measured, whether quantitatively or qualitatively. The usual operating definition of a developing nation is one whose gross national product (GNP) per capita falls below a certain international norm [10]. Throughout this book other terms will be used in place of "developing", i.e. Third World, less developed, and industrializing nations.

This book addresses itself to the processes of social and economic advancement, planned and practiced on a large scale by the developing nations around the globe. Such nations, assisted by international agencies, have for decades been in the forefront of systematic socio-economic development planning, policy formation, and implementation. This development process, often carried out under extremely harsh conditions, presents a tremendous challenge to management science, economics, and related disciplines. The sample of papers contained herein present a brief glimpse at the possibilities of the application of these disciplines in an important field. To some extent, they also highlight the looming failure which can prevail. Traditional assumptions, methodologies laden with values of affluent societies and overly sophisticated modelling

techniques, tend to crumble in the face of abject poverty, dire human needs, and other harsh realities.

The idea for this book was born during the 22nd TIMS International Conference, held in Kyoto in 1975, and benefited in its infancy from the advice and wisdom of such people as Rein Peterson and Martin Starr. Later, TIMS management, and particularly Robert Machol, were very supportive of a strong emphasis on the practical applications of management science. In its quest for usefulness, TIMS had to this stage devoted very little attention to management science in the Third World arena. This book is intended as a vehicle to initiate further work in this sphere.

An important lesson learned during the creation of this book is that those who actually apply management science and related tools to problems in developing countries are very often highly competent senior people who do not have the time or incentive to document their experiences in the form of a scholarly article. Conversely, academics who do have the time and motivation are generally not at the front line of activity. Furthermore, authors of management science papers traditionally have a burning desire to create sophisticated models. Typically, such models spend their entire lives looking for a problem to solve—a problem, which in the Third World, is likely never to present itself. In developing nations, resources such as computers, expertise, and data are in short supply or non-existent. Additionally, the managers, politicians, and all frontline users are skeptical. Many of the papers considered for this book (and rejected) contained models which are still out looking for that elusive application.

Progress made in the developing world is of great interest to wealthier nations, especially since they too are running into social, environmental, and resource constraints in their continued quest for further advancement. Both sides can learn much from each other. The editors, one a management scientist (Wade D. Cook) and the other an economist and development practitioner (Tillo E. Kuhn), truly appreciate this point since they happen to be located in Canada, once described as “the world’s richest underdeveloped country”.

In the following section the development process is viewed as a pyramidal structure. The concepts of goals, ends, means, measurement, and value systems are examined in the light of this paradigm. Section 3 briefly reviews the papers comprising the book. Concluding remarks are given in section 4.

2. Planning in a developing world: Process and techniques

2.1. The pyramidal planning structure—a paradigm

Development work spans an astonishing range of concepts and issues, which extend from the philosophical and highly abstract at the top, right down to the

earthy and very practical at the bottom. One can visualize a value pyramid, or an "abstraction-specificity", as it has been called (Gross [9]). At the top of the pyramid are the national goals, which we define as "expressions of ultimate national purpose and direction". They are grand, verbal, and often vague abstractions, such as freedom, equity, opportunity, and abundance. These are the ideas that have stirred men's souls.

They have become the symbol and inspirations of mass movements, wars and revolutions and the creation of new states. In declarations of independence and national purpose, in constitutions, charters and solemn covenants, they have become enshrined as national and international goals [10].

In the middle range of this pyramidal structure are various more tangible policy objectives, also referred to as intermediate abstractions. For example, abundance, one of the simplest grand abstractions at the top, would rest on various material quality-of-life objectives, such as minimum income for all and provisions of basic public services throughout the nation. These policy objectives are "the lifeblood of national debates on economic policy. They enter into the language of controversy, planning, negotiations and maneuver in bureaucracies, legislatures and courts" [10]. Numerical indicators, such as GNP, appear at this level.

At the bottom of the pyramid are numerous operational criteria, targets, standards, success, and failure measures (labor productivity, project net present value). Hard numbers abound. This is the realm of traditional management science, engineering-economic analyses, accounting principles, and financial feasibility studies.

Accepting the preceding as a useful paradigm, we must immediately recognize that the pyramid is an integral structure of interlocking parts. Goals or ends at the top, exalted and inspiring as they may be, are worth nought unless solidly supported by the lower tiers of policy objectives, operational targets, and means. The latter, in turn, have no purpose and value of their own, except to sustain the goal edifice as a whole according to some overall design.

The pyramid image is apt; the structure disintegrates if blocks are removed. So does a national value structure if eroded anywhere. Lofty ends do not justify abhorrent means. Means, however effective technically, must serve legitimate ends. There is great danger in focusing on one level of the value structure only: "At times both the grand and intermediate abstractions become empty shells, devoid of meaning and content, or else a shoddy facade to disguise tyranny, slavery, prejudice, exploitation, stagnation or intellectual or moral bankruptcy" [10]. But at the same time, the so-called pragmatists, who quite competently at the base carry out their limited operational tasks according to their specific narrow criteria, often slavishly serve some unstated ethically good or bad goal at the top, possibly without being aware of the ends-means relationships.

The key challenges in development work are to initially understand this web of cause-effect connections within the pyramidal structure between ends and means, goals and operations, abstract and practical, and then to forge appropriate policy linkages between them. As the contributions in this volume show, developing nations are in many cases doing so quite effectively through institutions and mechanisms of planning. Stated national goals provide an overall sense of direction for the national plan. The plan is broken down into goal areas, sectors, and programs which are consistent with each other. These, in turn, are implemented at given times and locations through specific projects, defined as the smallest decision-making and management units generating both identifiable inputs and outputs.

Naturally, planning ideologies, semantics, particular arrangements, and practical achievements differ from country to country. There are "top down" and "bottom up" approaches and iterative methods which combine both. But, the essential feature is the conscious linking of the desirable (goals, ends) with the feasible (various means and implementation mechanisms) through policy formulation and action.

2.2. Measurement and intangibles in the developing economy

The ends-means pyramidal structure delineates formidable problems of value systems and measurement in development work. While projects down at the operational level can seemingly be assessed in hard numbers, they often trigger non-quantifiable repercussions higher up in the value structure. McKean [13] refers to these as "intangibles". A new industrial plant, for example, will not only generate monetary costs and revenues, but will also disrupt the social system and the natural environment.

The developing economy comes with its own breed of special problems of measurement and modelling. An interesting example, as related by Glen and James [8], has to do with an attempt to apply linear programming in a production line operation in India. The modeller involved conscientiously went through all the stages of data-collecting relating to machine capabilities and worker efficiency, monthly demand for the various products, plant capacity, etc. In solving the problem the optimal mix and staging of production, the level of staffing and so on were determined. The modeller, however, ignored the fact that full employment had to be maintained, and that the same level of production had to be carried on each month. The objective was not to maximize profit, but rather to keep as many people employed as possible.

Political influence is often a predominant intangible factor. Theophanides' article herein cites this in the case of project assessment in Greece. Projects are not necessarily always implemented because they are technically feasible or profitable. They are quite commonly done to attract votes.

2.3. Multiple competing objectives

The issue of conflicting objectives, even those which are quantifiable, is difficult to deal with. Project assessment and priority allocation in both developing and developed economies have been greatly hampered by this phenomenon. Construction of a new highway, for instance, will serve mobility, yet it may also disrupt local business, farm lands, forests, and recreation.

Approaches such as utility theory (Fishburn [6]) have been proposed for combining these competing dimensions. The economics and MS literature contains literally hundreds of theoretical and "applied" articles on the subject. Utility theory as a technique for the solution of practical problems has, however, fallen far short of its goal.

A somewhat more operational modelling tool is goal programming, pioneered by Charnes and Cooper [1]. This approach has a great deal of promise in answering some of the questions posed in the paper by Sanghvi and Sanghvi in this book. Various types of goal programming models exist. One form of particular value is that referred to as pre-emptive goal programming (Charnes, Cooper, and Ijiri [2]). This technique amounts to assigning ordinal priorities to the dimensions first. Then, the problem is solved iteratively by moving from highest to lowest priority goals.

Goal programming has had some success in the past decade. It does require, however, that all dimensions be quantifiable. This is rarely the case in development work.

The article by Cook investigates models and techniques which have been applied in the developing arena, including models for dealing with the above-mentioned problem areas. Significant progress has been made, but the problem of conflicting objectives and intangibles essentially remains unresolved in any structured fashion.

3. Development approaches: Highlights, common perceptions, and contrasts

We now discuss briefly the individual papers in this book in the order in which they appear. While these contributions stand on their own, of course, a review of major points, common perceptions, and contrasts among them will be useful.

The overview by Higgins takes the reader on a journey through time and space. This history of planning takes us from the neo-Keynesian growth models of the fifties, through a variety of approaches adopted by Libya, Indonesia, the Philippines, and Sri Lanka to subsequent advances in spatial planning in the US, Canada, Europe, Brazil, Haiti, and elsewhere. The discussion of the unified approach of the 1970s, including its application to an almost empty region on the east coast of Malaysia, is noteworthy. The basic

needs controversy and self-reliance approaches (Haiti, India) are applicable today. Looking ahead to the 1980s, the paper asks whether this will be the decade of institution building, combined with the disappearance of the market and the nation state. Global management coupled with local initiative is foreseen for the future in the following passage.

Thus we seem to be moving towards a concept of planning as "management", in the sense of providing an institutional framework within which experts can provide technical assistance but with the people directly concerned making the choices, as members of social groups of various sizes, from a single cooperative to a community. This approach is perfectly consistent with the concept of Self-Reliance, which insists that truly effective democracy can function only at the grassroots level, within communities of manageable size, where each individual can have his say but the decisions are collective. In this system, with some outside expertise to analyse and present options in a realistic fashion, the people themselves can do their own planning.

Theophanides, within the Greek setting, shows the overriding importance of project management and implementation, rather than of finance, in the development process. He systematically discusses the harmonization of national, sectoral and project planning and the World Bank's four project appraisal stages: project identification, preparation, evaluation, and implementation. To the Bank's list of six standard project evaluation aspects (technical, economic, financial, organizational, managerial, and commercial), he plausibly adds environmental, sociological, and political aspects. These "should be covered in the project evaluation stage by extensive qualitative (and possibly, quantitative) analysis ... because they have a significant bearing not only on the stream of costs and benefits of the project but also on their eventual materialization".

Kenya's development experience, as related by Ndegwa and Kuhn, demonstrates that substantial economic and social progress can be achieved even without valuable minerals, fertile land, and other resources. Kenya's performance must not be seen only in terms of GNP but, more important, in decolonization, rural development, social development (education, health, welfare programs, etc.), diversification of the economy, and the establishment of effective institutions for development. Various factors contributed to Kenya's satisfactory development performance, including effective political leadership and administration, commitment to development planning, and sound management of the economy through effective policies and resource allocations. Project evaluation and implementation mechanisms perfected by Kenya and the national ideal of Harambee (self-help) parallel ideas put forward by Higgins and Theophanides. Further development of the planning system itself is foreseen, including decentralization to the districts and greater involvement of the private sector.

Cook investigates a broad class of models and techniques which have been applied to problems of priority planning and allocation in relation to project

selection. As is stressed in the Theophanides and Riedel papers, projects, particularly those pertaining to transport, construction, and water resources, are the lifeblood of a developing nation. It is in such areas that much of traditional cost-benefit analysis theory, one of the early MS models, was field tested. With regard to multiple attributes and intangibles, various ranking models and associated applications in the developing environment are examined. As an example of current modelling methodology, applications of zero base budgeting in a variety of Third World settings are briefly discussed.

A problem of primary concern to governments of less developed nations is that of dealing with the demographic makeup of the population. Schinnar investigates this problem using a Leontief-type input-output model. This model is capable of determining the aggregate impact of monetary policy on the proportional component of the various elements of the workforce. Utilizing data on the economy on India, he demonstrates that although socio-economic systems are presumably responsive to government intervention policies, the prime target, labor force, appears to be virtually invariant.

The paper by Lee-Smith and Lamba relates a comprehensive approach to settlement planning. This sizeable site and service scheme in Nairobi, financed by the World Bank, provided urban facilities for several thousand low income families, who built the houses on a self-help basis. Included were not only the basic infrastructure for housing, but also easy credit for the families, schools, health and community centres, and employment opportunities. Combinations of social science and management science techniques were employed to manage the project itself as well as a monitoring study by the government. The authors discuss the usefulness in this situation of models developed by such scholars as Horst Rittel, Amitai Etzioni, and John Warfield. In urban settings, many value-laden social, financial, cultural, and physical parameters interact, giving rise to conceptual and methodological difficulties of the kind described earlier. As an interesting aspect, consensus formation is apparently a traditional skill among Kenyans and was brought to bear on this project. This aspect ties in closely with the suggestions made by Cook.

Jurgen Riedel diagnoses severe current weakness in government policy-making, planning machinery, and administration relating to construction. There are growing discrepancies between policy targets and performances, as well as between the great development potential of the domestic construction industry and the present encouragement of foreign involvement in this sector. These and other factors have resulted in stark and intolerable contrasts between unmet basic human needs and the erection of luxurious buildings in the big cities in poor countries around the world. To resolve these problems, Riedel conceives of construction as a system of processes within a comprehensive framework. He breaks away from traditional narrow economic analysis and develops a three-stage planning process which leads from inventories and scenario formulation through broad long-range national planning and modell-

ing to specific projects and short-term programming. He concludes with an analysis of the interactions among the parties involved in the construction process—client, investor, planner, architect, construction and design engineer, contractor, suppliers, and trades.

The situation addressed by Cooper and Tamimi offers a significant diversion from those of the other papers in this volume insofar as it deals with a wealthy developing nation. Like the paper of Lee-Smith and Lamba and that of Riedel, however, it does bear out the importance of the construction sector in the development process. The family-housing problem in Saudi Arabia clearly does not involve the allocation of scarce monetary resources; rather, it is a massive planning problem. The scarce resource is adequate skilled labor. The need to import this commodity has presented that nation's government with many difficulties, not the least of which is the requirement for even more housing to accommodate this labor force. This multiplier effect is a significant one. As with most of the planning problems encountered, multiple goals and objectives are involved. The need to accommodate such in modelling the problems of developing nations is stressed both by Sanghvi and Sanghvi and Theophanides. The paper also bears out the "basic needs" approach of Higgins and Ndegwa and Kuhn.

Somewhat in the class by itself is the contribution by Singhal et al.; an application of a classical OR model (the transportation model) to a distribution problem in the cement industry of India. The particular application tends to be relatively free of political and other "messy" restrictions, and therefore lends itself readily to modelling via a standard technique. One important practical consideration does lie beyond the standard mandate of the model: the design of marketing regions. In the current operating environment this is dealt with through heuristic methods. This simple approach, as distinct from the other more sophisticated methods, allows active participation by the cement controller. This simplicity is in keeping with Singh's recommendations in his paper. As with the Klein and Roe application, the client was kept heavily involved during the development of the system. This is a critical contributing factor in the system's successful progress through the implementation process to date.

Health and agricultural groups have failed to grapple with the malnutrition problem, now rampant in many parts of the developing world. Sanghvi and Sanghvi cite this as the most important and challenging of all problems facing less developed countries today. A survey of existing models to solve the malnutrition problem is provided; in each case the strengths and weaknesses are highlighted. A central message of the paper is that the current models aggregate to too great an extent. One cannot effectively utilize the "average" malnutrition indices as is the case in the linear programming approaches. The need for models dealing with the multidimensional, rather than unidimensional, nature of the problem is a pressing one. Those models posed by Cooper

and Al-Tamimi and by Cook could lend considerable assistance in this area. Perhaps the key message of the Sanghvis' paper is that increases in food supply, as called for by Klein and Roe, do not help those who cannot buy the food. The effective demand through redistribution of income is the key variable. Given Schinnar's findings regarding the stability of the work force under fiscal policy action, however, one is left with doubts about plausible solutions to this important problem.

As an important step in solving the malnutrition problem of developing nations, Klein and Roe investigate long-range planning in the agricultural sector. As stressed in the Singhal paper, the institutional framework is generally the overriding factor in implementing any such model. Klein and Roe point out that the environmental-political setup should be considered at the outset, and taken as a constraint on any system developed. Attempts to "deal with" the environment after a system has been developed generally lead to dismal failures. Various linear programming formulations are used to investigate agricultural planning. These models allocate at both the subsector (cattle vs. crops) as well as the project level.

A.J. Singh offers a broad review and critique of management science applications in the health care field in developing countries. He sees the role of MS as two-stage. First, simple models such as PERT/CPM, GANTT charts, and zero-base budgeting should be used at the macro level in planning, teaching, and solving general problems. Second, as the problem is dealt with in greater depth, more sophisticated models can be brought into play—linear programming, cost analysis, demographic tools, etc. Like a number of other authors, Singh points to the lack of implementation of most health care studies—lack of data, reluctance to change, and different perceptions of the problem on the part of the scientist than on the part of the health administrator are the chief reasons for this. Lack of scarce resources is, of course, always present. Singh makes specific recommendations for implementation which, in summary, advocate the use of simple models and proper communication with the user. He summarizes a long-standing perception of the management scientist: "The Management Scientist is regarded by health care people as a mathematician who builds models for end products that are not usable".

Flagle and Ortiz review a number of Operations Research applications in the health care field. The tools used, such as simulation, mathematical programming, and various statistical models, have been applied at two levels—clinical and community. At the clinical level there have been numerous applications of such techniques as Monte Carlo simulation in hospital operating rooms, ambulance scheduling, etc. At the community level statistical and mathematical programming models tend to be more effective. The models reviewed by the authors come from actual applications in Colombia, Mexico, and Brazil.

Distinctively different from the two previous papers, the contribution by

Eaton et al. concentrates on a particular aspect of health care. Specifically, it has to do with the location of "promotoras", or medical guidance councillors, in rural Colombia. Additionally, it deals with the problem of allocating ambulance services to the resulting health care centres. Like the Singhal paper, this application is one to which standard Operations Research tools apply. The development team has clearly taken care to involve the client, and has paid close attention to the practical and multiple goals connected with the problem. The authors, who are in the process of implementing parts of their proposed model, summarize their success: "The problem is defined by local planners. Techniques use information that can be easily obtained, algorithms are comprehensible to local agency personnel and are compatible with existing computer software. The results can be interpreted both in terms of the multiple goals of the agency managers and in the political and institutional context of the country."

One of the prime areas of importance in the present day in both developing and developed countries is energy demand and supply. Hoffmann investigates the determinants of energy demand in Brazil. Brazil is an important developing nation, consumes substantial energy, and has data available to test prospective demand models. For these reasons that country is an ideal pilot test site. Hoffmann draws a number of conclusions from his investigations. For example, the fact that non-commercial usage amounts to nearly 30% of the total consumed, is an important finding. Most surprising is the high share (35%) of non-commercial energy going into manufacturing. Other countries may benefit from Brazil's experience in this respect. Hoffmann's final conclusion is noteworthy: "The price response turns out to be highly significant, suggesting that price policies could be an important tool for shaping a developing country's energy demand."

In the final contribution B  at Jenny gives a synthesis of top development policy issues for the next decade, touched upon in many ways throughout this book by other authors. Certain key messages rise to the surface. First, there is a pressing need for a new international value system. Costs and benefits as perceived by developed nations are not necessarily those which developing nations will stress. Second, the important development resources for the future are food, energy, and technology. With food in particular, the situation is alarming. There is widespread hunger, and dependence on food supplies from industrialized countries has increased over the past two decades. Worldwide energy scarcity imperils sustained development. On the technology front, the inappropriate transfer of this third resource has turned it into an instrument of dependence and oppression, rather than of progress. The proper handling of these three development parameters is a prime goal for the 1980s. A final important message is that Third World nations need to become more self-reliant. Many Third World countries are sinking ever deeper into debt in order to finance essential imports. This is particularly true of oil-importing nations.

This "debt trap" can only result in countries falling into the clutches of the International Fund.

4. Conclusions

The pyramidal structure provides an apt paradigm of how a development process should operate. Kenya offers a good example of how this works in practice. Shortly after independence in 1965, the broad goals of this young nation were clearly stated in the Constitution, in several manifestoes, and particularly in a lucidly formulated Governmental Sessional Paper (see [14]). The long-term goals include political equality, religious freedom, social justice, freedom from want, ignorance and disease, human dignity, equal opportunity for all citizens, and high and growing per capita income equitably distributed. For fifteen years now Kenya has consistently pursued these goals through a series of five-year development plans and will continue to do so. President Arap Moi's introduction to the current fourth plan, which points to a continuation of the annual economic growth of over 6% accomplished since independence, states this very well.

As a stark contrast, Canada is a relatively poor performer in this sphere. Canada's currently valid constitutional document is *The British North America Act*, which in 1867 provided but one single goal statement, namely: "And whereas such a Union would conduce to the Welfare of the Provinces and promote the interest of the British Empire." Apart from that one utterly obsolete declaration of national purpose, the B.N.A. Act deals mainly at tedious length with parliamentary and housekeeping details. There is nothing to inspire the soul, nothing that would give a sense of national direction and future destiny.

One could ask fascinating questions why Canada has failed so far in goal articulation leading to planning when Kenya, for one, has succeeded so brilliantly. Do the starker needs in a poorer nation spark clearer enunciations of basic purpose? Do we in the West still believe that the market mechanism can carry planning functions? This topic is discussed in the Higgins' paper. Do the many choices and alternatives generated by a wealthy society, including frivolous ones, detract from unified national action? How strong has been the influence of international development agencies, especially the World Bank, in implanting goal formulation and planning processes in the poorer nations? Could differences in competence of civil servants be a factor? Or the different political settings? Perhaps Richard D. French identified Canada's weakness when he observes:

Planning systems which are unduly pluralistic, which fail to force choice, will squander political resources, just as management control systems which have the same features will squander financial resources. Planning systems which are unduly elaborate and insular will identify false problems and fail to confront real ones [7, p. 155].

The future world-wide development problems that must be tackled are formidable. As stated by Jenny: "the task of development planning should be to contribute to building national self-reliance, to mobilizing endogenous forms of modernization, and to broadening the socio-political basis for development and growth. Better management of the great external dependencies—especially in food, technology, and energy—is believed to be the great challenge for the future."

Ideas expressed by some of the authors herein have suggested that drastic reorientations of development philosophies and policy directions must take place in order to accomplish the awesome development tasks of the next decade. Profound changes in global priorities at the very top of the international value structure will be necessary, for example, by moving resolutely from crippling conflicts and tenuous international dependencies in food, energy, technology, trade, and finance, to peaceful coexistence and creative self-reliance in many spheres.

One is confident that once the ultimate development ends for the 1980s and 1990s are clearly established, the appropriate means and mechanisms can be marshalled and put to work. This book shows that given clear overall goal directions, management scientists, economists, and planners can, with their special skills, make highly productive contributions to true development progress.

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