MODELLING IN THE PLANNING PROCESS: A CRITIQUE

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Experience with respect to quantitative and formal modelling techniques in planning and the acceptance of these in the planning process tend to parallel experiences of business in general; both with respect to a commitment to the modelling process and a disillusionment as regards results.

This article seeks to examine the use and value of formal models in the process of planning and to draw comparisons from experience in the general field of business planning, or strategic management.

Ondervinding m.b.t. kwantitatiewe en formele tegnieke van modelbou in beplanning en die aanvaarding hiervan in die beplanningsproses neig om besigheidsondervinding in die algemeen te weerspieël; met betrekking tot beide 'n toevertrou aan die proses en 'n teleurstelling aangaande resultate.

In hierdie artikel word daar gepoog om die gebruik en waarde van formele modelle in die beplanningsproses te ondersoek en om vergelykings vanuit die algemene veld van besigheidsbeplanning of strategiese bestuursondervinding, te trek.

1. INTRODUCTION

There has been a growing acceptance and use of quantitative or formal modelling techniques in the planning process at both the professional and academic level. Substantial efforts in terms of both human and financial resources are directed to their development and application.

The planning interest parallels that experienced by business in general, (Naylor and Schauland, 1976), where there is evidence of both extensive commitment to the modelling process and, in many cases, disillusionment with the promised 'pay-off', or results (Naylor and Mansfield 1977). The field of business planning, in particular, seems to enjoy diminished satisfaction from the modelling process:

> ". . . most of the planning models which are being used are not significantly influencing the actual strategy formulation process within the firm" (Hall, 1973: 33)

Prima facie, it is tempting to lay criticism directly at the modelling process per se. A more useful exercise, however, would be to consider its relevance *within* the context of the planning process, before making any judgments. If parallels can be drawn between relevance in other areas, such as that of business planning, added value should be obtained.

With this in mind this paper seeks to examine the use and value of formal (essentially quantitative) models in the process of planning, and to draw comparisons from experience in the general field of business planning, or strategic management.

Firstly, an attempt is made to briefly describe the planning process and, in particular, the changing emphasis in planning. The nature and application of models within the planning framework in general is then considered. Thirdly, an attempt is made to evaluate the usefulness of models to planning by considering some of the difficulties arising from their application, and the advantages and disadvantages claimed for these techniques of analysis.

At the outset, it should be emphasised that the approach in a paper of this scope is necessarily general, descriptive of features common to formal models and different levels of planning, or business, rather than of specific situations and techniques.

2. THE NATURE OF PLANNING

Although it is possible to distinguish two broad levels of planning, viz. urban or local planning and regional planning (Hall, 1970:1), much of what is said about the features of the planning process is common to both. Briefly, planning, like economics, concerns itself with the allocation of resources between alternative uses, or constraints; regional planning denotes the (spatial) allocation of resources in terms of national policy objectives, whilst local/urban planning is concerned largely with issues of intra-regional or urban (and largely physical) planning. In practice, however, the changing emphasis of planning and the development of the 'city-region' renders this distinction superfluous for the purposes of this paper.

What then has been the changing emphasis in planning, as loosely defined above, and what are the main features of the planning process as it is known today?

Recent developments in both planning education, and in the planning process have come about largely in recognition of the increasing complexity of the urban/regional fabric, the rapid tempo of change in that fabric, and the growing acceptance of the 'human factor' or 'quality of life' in planning. Simplified approaches, such as the earlier (physical) traditions of 'survey, analysis and plan' are recognized as inadequate under these circumstances. Instead, we are witnessing an increasing concern with issues relevant to the socio-economic and political structure of the environment. This concern has been accompanied by increasing inter-disciplinary or 'meta-disciplinary' cooperation on the part of both social scientists and planners and, indeed, the natural and business scientists, (who represent an im-

portant seedbed of ideas for the development of models).

The increased tempo of change has emphasised the need for more flexibility in the planning process and underwrites the importance of forecasting and predicting change. The recognition of complex interdependence in urban life – at both physical and socio-economic level – has also emphasised the systems approach to planning problems.

These trends have a close parallel in the business environment, where

> . . . "the innovative firm of the future is a people-intensive firm which depends more than ever on human imagination, creativity and initiative" (Ansoff and Brandenburg, 1969:67)

The early tools of the planner are clearly inadequate in the light of the complexity of the environment within which policy decisions and action must now take place.

Formal models of urban and regional systems are increasingly accepted as a solution to the problem, allowing the assimilation of far more data into the decision-making process and thereby extending the experience or judgement available, whilst diminishing the range of human error. (Bayliss, 1968).

The business perspective is similar:

> "New techniques for rational, scientific decision-making will become essential . . . They will require assistance from a new blending of the quantitative systems perspective of the management scientist with the organisational and behavioural perspective of the social scientist". (Ansoff and Brandenburg, 1969:67)

Before turning to the modelling process to see how it serves this function, one can perhaps conclude this section by briefly returning to the planning process indicated earlier, in order to consider the major requirements from this (modelling) process.

At the more localised level, structure plans, for example, may be considered as having in common many of the features of the new emphasis in planning, viz. the view that structure plans represent: . . . "the development of a *continuous* adaptive process where flexibility, a gradual learning procedure, and monitoring are of greatly increased significance, where an attempt is made to integrate the planning of the different sectors of the urban system, and where the major emphasis lies in the public presentation for debate of a number of elaborated and evaluated alternative strategies" (Cordy Hayes, 1971).

Increased concern with regional problems and policy in the context of national economic planning goals has also led to the recognition that more rigorous analytical tools at regional level are required. Foremost amongst these are attempts at improving our understanding of industrial structures and development, and the scale and impact of public spending, both of which represent fruitful avenues of exploration within a (regional/inter-regional) input-output framework.

2. THE MODELLING PROCESS

In order to appreciate the relevance of formal analytical techniques or modelling in the planning process, it is perhaps useful to start by defining what is meant by a model, to then consider its purpose in general terms, and finally, to assess its nature and application in planning.

A model can be defined as a 'formal representation of a theory or hypothesis' (Wilson, 1970:179); or, more generally, as descriptive of the system that it represents (Lee, 1973). As such, it represents, often in abstract mathematical terms, the use of simplified notions to break down real life complexities, allowing the designer to explore novel situations relatively cheaply and thus increasing his powers of evaluation and judgement. (Bayliss, 1968.). In the words of Parry Lewis (1973:3), a model denotes . . . any set of equations, computer instructions, or other rules that is designed to translate existing information into estimates of unknown information"

The urban/regional system comprises a complex network of interrelated factors (or subsystems), which have been conveniently grouped under the following categories: mobil objects, (such as, people, goods and vehicles), immobile objects (viz. infrastructure and land), activities (e.g. living, working, shopping, etc.) and interactions, (such as travelling) (Wilson, 1978). The study of these subsystems and/or their interrelations is the major task of the planning process, specifically:

- to describe the system or define the problem (in terms of planning objectives),
- to provide the necessary analysis for solving the problem or meeting the objective(s) set,
- to evaluate and choose amongst alternative(s),
- and to implement and monitor the resultant action programme.

This represents the problem-solving, or decision-making sequence followed by business management.

It is in the latter two steps of the planning process that models have a particular part to play, as well as in analysis, (by allowing the orderly processing of unusually large quantities of information so that a given situation may be more easily understood). In evaluation, the model helps to identify the solution or policy which meets the objective(s) or helps to identify the advantages and disadvantages of a plan and/or offers a comparison of alternative plans. In implementing and monitoring the plan, the model provides the basis to test the behaviour and characteristics of the system at frequent intervals, viz . . . the means by which the relevance of planning policy can be maintained (Lee, 1973).

In general terms then, the aim of models in the planning process can be viewed as:

(i) Firstly, to serve as descriptive of existing systems or situations, and
(ii) secondly, to project future states of systems.

It is the latter function, generally associated with predictive or planning models, that provides an important aid to the design aspect of planning, or the selection of alternative policies. Descriptive models are generally concerned with representing an existing situation and attempt to increase our understanding (of the urban/regional system) by providing information not readily accessible by other means. Predictive, and planning models seek to simulate future, rather than current situations, the latter, i.e. (planning models) have built into them certain goals and constraints. The forecasting function of models is considered particularly valuable in the planning process.

The application of models in the study of urban and regional systems has been widespread. Having "entered the environmental studies field in the first place through the transportation door" (Bayliss, 1978:20), they have been extensively applied to planning issues concerned with the mechanics of urban life, such as residential and job location, economic activities, retail and service location, land-use allocation, population forecasting, and the like. It has been suggested, that, in the future, the "quality of life" will be of increasing importance in the application of models – to problems such as social and economic life styles, environmental quality, public participation and the role of value judgements in the planning process, socio-spatial mobility, etc. (Wilson, 1968). These new directions are likely to impose additional difficulties on the use of models in operational terms, as the next section suggests.

3. MODELLING – THE PAYOFF?

In the previous section some of the potential benefits from using modelling techniques with respect to planning, were noted. Briefly these are:

- Their use makes feasible, and reinforces many of the existing and newer trends in planning, for example, the testing of alternative plans on a comparative basis, encouraging flexibility and continuity rather than 'once-for-all' planning, as well as promoting the (cyclical) process of learning in planning; in addition, their adaptability to the systems approach facilitates the investigation of important interrelations in the urban/regional framework. Mention has also been made of the fact that models may also serve to facilitate rapport between the planner and the planned, the 'democratization' of planning, (Britton Harris, 1965:10) by making more information available on a systematic basis and, at the same time, reducing the planner's subjective control over the planning process.
- They act as an organisational and intelligence aid, giving concrete form to ideas or theories implicit in the planning process, and in the process, impose a certain measure of discipline on the planner to present his schemes/ideas in a rational orderly and often objective manner.
- Lastly, we may mention that, in addition to the descriptive/predictive capabilities of models, their standardised, formal approach provides a rigorous, speedy and comparative basis for decision making across broad levels of (inter) regional and urban policy.

An impressive list, indeed – but, unfortunately representative of part of the picture only. *A model is not an end in itself*, but merely a technique or aid to assist the role of human judgement in formulating, evaluating and solving problems in the planning process. In particular, judgement and intuition are most essential for controlling the model in terms of objectives, which must be carefully formulated beforehand: and in assessing the results obtained from the model against these objectives, i.e. *the model itself does not produce a plan*. Even within the confines of a formalised model approach, there exists always the possibility of human error. In fact, modelling is sometimes singled out as culprit: for example, by blunting the application of the human element, particularly where meaningful relationships in the complex social fabric (of the city) are obscured (Britton Harris, 1965.)

Secondly, the advantages claimed above refer essentially to a *good, operational* model; and the question arises whether this is in fact true of the general *application* of models to the complex environment within which the planner operates, both within the urban/regional system, and in the business context.

In addressing this question, it is possible to discern some basic similarities that confront both the urban/regional planner, and his business counterpart;

(i) The first concerns the large number of variables at issue in urban or regional studies. This aspect has more than one dimension, but the general limitations of data availability have received the most emphasis. Because of the time-consuming and expensive task of data collection, the modeller steers a path between the complexity and variety of the real world and computational simplicity. This has undoubtedly been emphasised in modelling for the planning process – particularly as the systems approach to planning has necessitated the use of highly aggregated variables. It is also very relevant to business planning. It is thus impossible to separate models and information systems as part of the same process, (with electronic data processing techniques as important operational go-betweens). A significant direction for research in the general field of model building must thus lie in the science of information – in determining the relevance of data to model building and in looking at its availability, collection and storage. Effective data banks are obviously an important feature of this task. It is important to recognise the mutual advantage of developing information/data systems in parallel with the process of model building, i.e. the existence of good information systems facilitates model building, and the development of better theories helps generate more adequate description, which in turn leads to more effectively directed forms of data collection. Of possible value in this respect is the development of "limited scope data processing models". (Hall, 1973:40). These will clearly be far less sophisticated, but will carry two important advantages: they will economise on the (scarce) data base and they will permit the intrusion or even dominance of the intuition, attitudes and general management and planning skills in the planning process. The research emphasis must also consider different and often more difficult forms of data collection, such as the need to move away from purely monetary, or physical measures and the problems raised by the need to consider the more intangible aspects of the new emphasis in planning, such as those represented in the 'quality of life'. Obviously, this latter aspect poses major problems for the future role of modelling in the planning process.

(ii) Secondly, a systems approach to the city/region emphasises its extreme dynamism in terms of interrelations and feedback in its component sub-systems. Lee suggests that these are rarely incorporated into largely 'partial' models

that dominate the field of urban/regional studies, (Lee, 1973). In this context, we may also note the problem of 'scale', namely that attempts to overcome the problem of combining sectoral and spatial disaggregation within an operational framework do not adequately represent the behaviour of individual households or single organisations.

(iii) The dynamism of the urban/regional system in terms of time is also largely neglected by models that largely fail to include time-varying relationships because of their complexity (e.g. in terms of the existence of time-lags between the action and reaction of the variables or sub-systems).

Time has a further critical dimension. Planning and managerial decision-making are activities that occur under continuous time pressures. It is hardly surprising that there is often little opportunity or incentive to explore, or utilize the full range of options presented by the modelling process.

(iv) Most operational models contain an essentially linear approach to many of the variables and relationships within the system, whereas the socio-economic system is characterised by the presence of non-linear relationships.

Insufficient attention has been paid to causal relationships in the planning process. Instead, there has been an undue reliance on "fit" from historical data to ensure the operation of the modelling process. In the turbulence of today's environment, this is inadequate.

> "In the face of such an upheaval (in the purposes of economic activity), even the most sophisticated tools of today's economists are helpless" (Toffler, 1970:131).

(v) Lastly, note must be made of certain issues arising from *implementing* the results of the modelling process. Modellers are often isolated from the actual process of decision-making. They are seldom called upon to shoulder responsibility for their deliberations. Clearly, more effort is required both in terms of educating decision-makers in the rigours of the modelling process, and in securing greater, all-round involvement in and commitment to the process. A closer accord between planner/modeller and decision-maker needs to be reached if part of the criticism of the (modelling) process is to be allayed.

4. CONCLUSIONS

If it is possible to generalise from the experiences of modelling in both the physical and organisational setting, the general application of modelling to the process of planning would seem to indicate a rather 'simplistic' view of the goals of the planning process and of the nuances of the environment. Models that are in operation are generally partial in scope only, are based on static or comparative-static techniques, contain variables/relationships that are essentially linear and are set at high level of aggregation. As such, they are largely probabilistic with little substantial basis of observed or hypothesised causal relationships. If the prime consideration in using a model is regarded as its capability of "reproducing the phenomena or the problems in which the planner is interested" (Lee, 1973:10), it would seem that the expectations from the application of models in the planning process remain, in considerable measure, unfulfilled.

In general, there would appear to exist some conflict between either developing operational, essentially simplistic models, with limited predictive power, (for example, because of their theoretical inadequacy) or striving for more theoretical ambitions, but failing to develop an operational model for planning purposes (Wilson 1978).

Here, it would be well to sound a note of caution about expectations. The first is that of intention. Modelling, like the planning that it supports cannot be all things to all people, hence according to Ansoff (1970:7).

"When an executive says that strategic planning has not worked for him in an era of turbulence, he is stating an obvious truth because it was never designed to do so . . . You might as well use a lawn mower to drive 200 km."

In the second place, the realities of the adoptor environment need to be carefully considered.

As a member of one of the less developed countries, as part of the "third world", where data sources are woefully inadequate for all levels of the planning process, one can perhaps be excused for approaching the subject of modelling with a certain measure of hesitancy. This hesitancy is as much a part of the planning milieu of town and country, as it is of business.

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