Gaining Acceptance for a Systems' Dynamics Model.

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ABSTRACT.

The paper discusses the reasons why Systems' Dynamics models frequently encounter considerable difficulties in gaining acceptance and suggests several ways for overcoming this obstacle. Resistance to models within organizations is usually generated by one or several of the following causes: insufficient credibility of model's proponents, inability to grasp model's usefulness, cultural background, fear of losing power and negative previous experience with models. In the special case of models addressing issues of wide public interest suggestions are presented on how to plan a communications strategy designed to generate support for the model or for the conclusions derived with its help.

INTRODUCTION.

Systems' Dynamics has made relatively little ground in gaining diffusion over the last 20 years. The doubtless publicity from the exceptional diffusion of a book like "Limits to Growth" does not appear to have accelerated significantly its wide acceptance.

In spite of the broad spectrum of potential applications and of a relative ease with which it is possible to communicate the contents of Systems' Dynamics models, as compared for example with linear programming models, the technique is slow in being widely accepted. It is used only in a few countries and then it is confined to isolated applications in spite of the fact that insights gained through study of behaviour of the modeled systems doubtlessly help to make better decisions on a wide variety of issues.

This author believes that two causes contribute to delay the diffusion of Systems' Dynamics.

Insufficient development of the Systems' Dynamics theory makes the success of its teaching highly dependent on the ability and on the perseverance of individual students to supplement this defficiency. Consequently Systems' Dynamics practical use has remained limited to those few who have mastered it through learning by trying, erring, sweating and correcting. The others have either abandoned the efforts to use the technique or have produced poor results that made in fact the diffusion of Systems' Dynamics more difficult.

The second major cause slowing down the diffusion of Systems' Dynamics is seen in the frequent rejection either of the intent to build a Systems' Dynamics model or in the rejection of its conclusions.

This paper explores this second problem, examines its causes and proposes a methodological approach aimed at obtaining support for the models and for conclusions derived from their use, provided that minimal conditions making this feasible exist in a given situation.

The rejection of Systems' Dynamics models usually appears to be rooted in one or more of the following reasons:

- lack of credibility of the people who propose to build the model,
- lack of confidence that the technique can be useful,
- background which makes it difficult to understand this kind of models,
- fear of losing power by those who should contribute knowledge of the system if their personal insights arrived at through effort and time were to be explicitly stated and perhaps more widely diffused, thus enabling others to take up a greater role in the decision making process,
- unfortunate experience with models in general or with Systems' Dynamics models in particular.

Several approaches are suggested to deal with the various situations encountered within organizations.

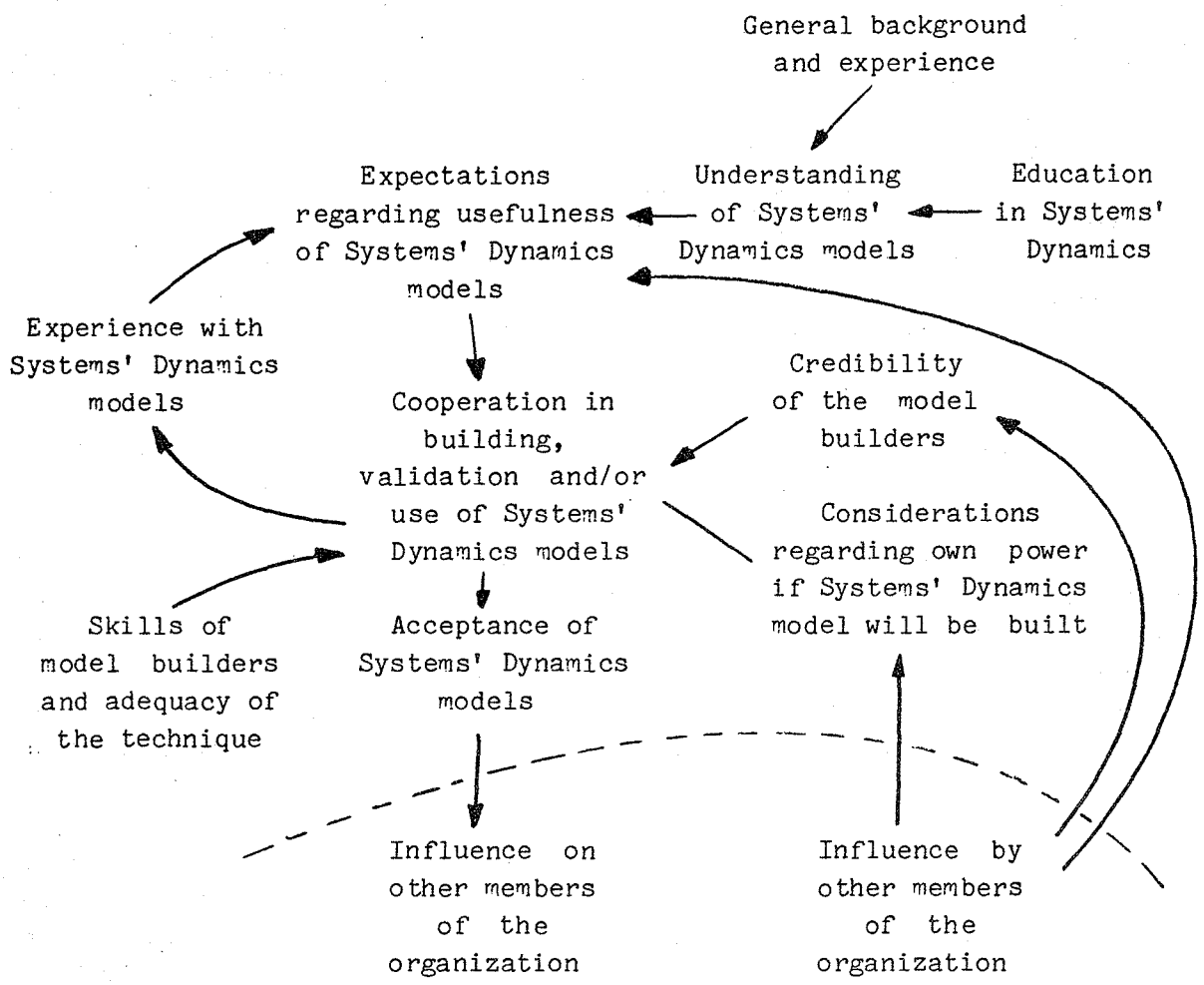
A particular case is examined when Systems' Dynamics models address issues of wide public interest and there is need to gain acceptance for the model from wide segments of public opinion.

MOST FREQUENT OBSTACLES TO APPLICATION OF SYSTEMS' DYNAMICS MODELS.

The causes and effects that most frequently interact and influence an individual within an organization to accept or to reject a Systems' Dynamics model are shown in Fig. 1.- The objections to such a model usually are to be sought among the ones described below.

Lack of clearly established credibility of the person or group that will build the Systems' Dynamics model may ground any effort to build it or to use it. Such credibility should not be taken for granted, in fact it is very frequent that there is a lack of confidence in the people who propose to build a Systems' Dynamics model. This lack of confidence typically leads to doubts that such people know the system to be modelled or that they know how to apply the technique.

Fig. 1.- An individual may accept or reject a Systems' Dynamics model as a consequence of a number of different, partly interrelated reasons.



Second comes the lack of appreciation for Systems' Dynamics models' usefulness. It is hard for many people without the specific experience in this field to understand how these models can help to master a better insight into the behaviour of systems they represent or how this insight can be used in practice. It is also very difficult for them to understand how certain data can be obtained and they doubt that initial approximate values or estimates of data even if fed into the appropriate logic will be of any use at all.

Third to be examined is the background and culture of the users, supporters or contributors to the models. Even when the appreciation of possible usefulness of the Systems' Dynamics models exists problems are frequently encountered in achieving understanding of the key steps that lead to insight

into the behaviour of the system being modeled. For many people it is difficult to understand how conceptualization is accomplished and what criteria are used to determine which variables are to be included in the model while others are left out. Some often are forced to exercise considertable effort to understand the chains of causes and effects embedded in a model. It is particularly difficult for some individuals to see why certain interactions were taken into consideration and others were left out of the model. The behaviour caused by the interaction of the various feedback loops is certainly not easy to grasp for people without training in systems' analysis. It becomes even more difficult for them to associate the observed behaviour with some causes that have dominant effects but are located either far away in the cause-effect chain or in some more distant past. Finally the use of data which represents aggregate, mean or most significant values is often suspect.

If any of the so far described objections exist to any extent, the reaction tends to take the shape of unwillingness to devote any time whatsoever to the models' building or use.

Fourth is the frequently encountered fear that the position of power or respect enjoyed by a person through his or her insights or knowledge of the system will suffer as this knowledge will become shared by others after it has been contributed to a model and perhaps enhanced and farther developed beyond the point at which it is at the moment. This situation makes for an outright intent to reject any efforts for the building or utilization of a model.

Fifth is the case when there is previous precedent of unsuccessful attempts to build a computer model or a Systems' Dynamics model in particular. The past frustrating experience frequently makes people take the attitude "we know this already, it won't work so why bother". This attitude can best be described as a "negative apathy" and it is rather difficult to overcome.

WAYS OF OVERCOMING OPPOSITION TO SYSTEMS' DYNAMICS MODELS.

First it is necessary to determine the causes of opposition to Systems' Dynamics models in each case by the different people whose support is essential, only then is it possible to determine whether and in what way can such opposition be transformed into some measure of support.

If rejection of the model is caused by lack of credibility of the person or group which is to build or introduce the model it is essential that such credibility be established by demonstrating the ability to understand the system to be modelled and the capability to build and/or guide effectively the users in the utilization of the model.

If the resistance to the building or to the use of a model is caused mainly by lack of appreciation for its usefulness, it will generally be necessary to build perhaps a simple model corresponding to the situation the prospective user is interested in and to illustrate with its help how insight can be gained into the systems' behaviour or how the model can be used for improving decisions. Only with very open minded people is it immediately fruitful to illustrate the usefulness of Systems' Dynamics models on examples which are not directly pertinent to the area of their experience and interest.

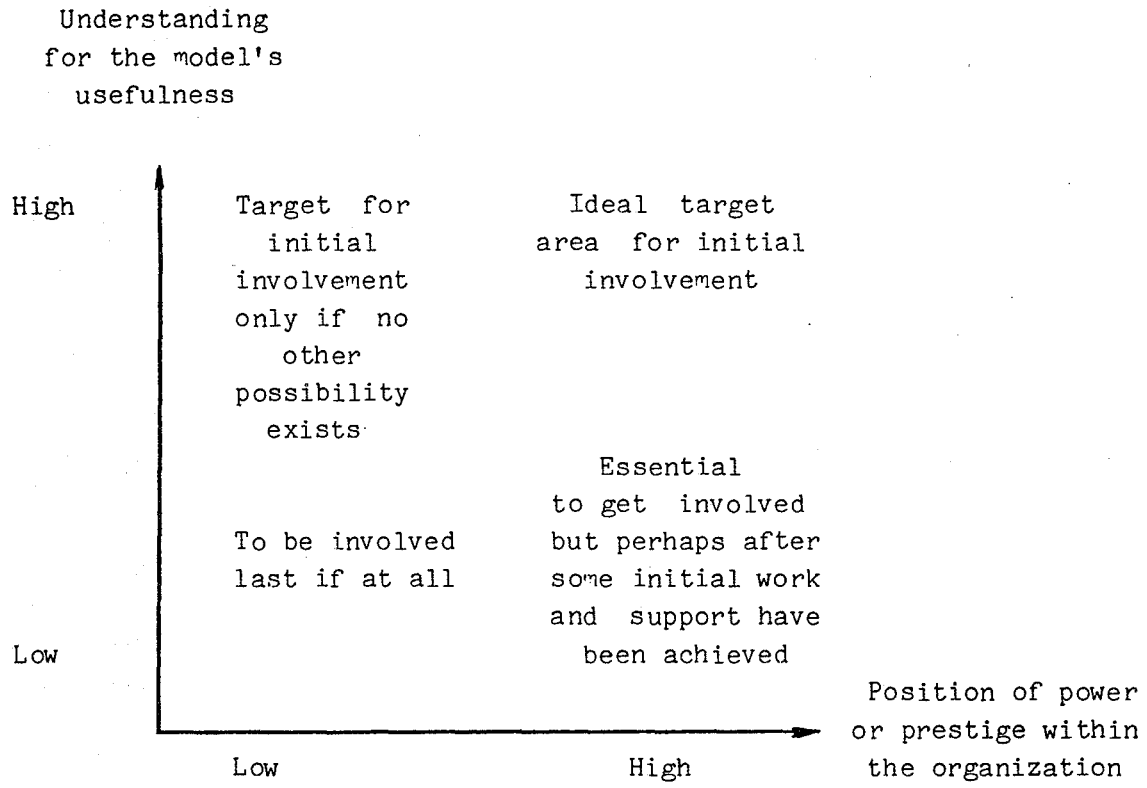
Frequently in order to achieve understanding for the usefulness of the model it may be sufficient first to conceptualize the various elements that need to be considered and then to draw the cause-effect diagram which becomes a guide to reasoning about the behaviour of the system. On relatively few occasions does it become necessary to build a complete computer model and to simulate its behaviour for demonstration purposes.

Once the simple model has been built one can proceed to explain how it can be made more perfect for its scope and what sort of effort is needed to achieve the results.

When interest in the model has been established it becomes necessary to obtain understanding for the way in which it is built. The best way to achieve this is to build the model together with the users. This, however, is not always possible. When one is faced with the need to obtain acceptance for a model that already exists it becomes indispensable to plan very carefully its explanation. Thought should be given as to whom the model should be explained first and who should be left for the end. It is usually best to start with the people with greatest power or prestige within the organization in which the model is to be used, provided that their background and time availability are such as to make it likely that they will understand the explanation. The explanation should be planned in a way that will reduce the time requirements to a minimum. It is advisable to give at least a complete overview of the model and of its behaviour in less then an hour even if at expense of detail. The interest should be stimulated, however, within the first few minutes not to loose the audience from the very beginning. Technical details should in most cases be left out of the main presentations to be taken up only during sessions with specialists. Only when a band-wagon situation of support for the model has been achieved is it convenient to aim at the most recalcitrant members of the organization in the hope that their interests and attitudes may have been influenced by others in the meantime.

One useful way of selecting a sequence with which to approach the different members of an organization can be derived from the Fig. 2.- naturally if it is at all possible in a given case to choose the order with which to proceed.

Fig. 2.- It is convenient to get involved first the people near the top provided their background is adequate to understand the usefulness of the model.



If the model building effort or the conclusions of a model are rejected because there is fear of loosing power on the part of some individuals it is necessary to find out whether the person refusing to cooperate may be immediately instructed to change his or her behaviour. If this can be achieved the cooperation might be forthcoming although grudgingly. To improve the situation or in the case when it is not feasible to have the person in question instructed to cooperate, it becomes essential to understand thoroughly the motives a person has to fear losing power. On closer examination it may turn out that his position might actually become reinfoirced through the use of the model and through a more thorough understanding of the situation. If this were the case it may take time and effort to persuade a person about the need to cooperate but small steps at a time and persistence usually render results. This approach, however may prove too costly and time consuming to be applicable under all circumstances.

The last, but not least important, is opposition to Systems' Dynamics models stemming from past bad experience with models. In this case one should, while avoiding to condemn openly the preceding experience, show how and when a correct application of a model can be developed and what the differences are between the proposed model and the new approach to build it as compared with the model built in the past. The explanation, if correctly handled, leads to autodiagnostics as to why the previous model proved a failure and some measure of support for the new effort is a frequent result.

GAINING APPROVAL OF VAST SEGMENTS OF PUBLIC OPINION FOR MODELS RELATED TO ISSUES OF PUBLIC INTEREST.

When a model addresses issues that require involvement of different and numerous social groups with widely varying backgrounds and interests it usually becomes necessary to obtain consensus regarding the model itself or its conclusions.

Several communications strategies can be designed to achieve the above objective. In all cases a good strategy will be the result of a careful planning of actions on the following issues:

- What kind of response is expected from the members of the various groups as a result of their approval of the model or of its conclusions.

- At what stage and how will the endorsement of the opinion leaders be obtained.

- When and in what manner will the major power holders be approached and what kind of involvement will be sought on their part.

- Which forums will be used and in what sequence to ensure the models discussion and diffusion bearing in mind that the prestige and credibility of a forum may transfer prestige and credibility to the model and to its conclusions.

- What will be the contents of the communications and how will these contents be presented to best reach each audience and to take advantage of the particular media through which communication will be delivered. For diffusion to a vast public through mass media for example, the model's basic relationships must be presented in as simple a way as possible.

Frequently it is also necessary to establish a two way communication with some exponents of the various groups with interests in the model or in its conclusions. This may require considerable intellectual and logistical

resources, particularly if it is likely that a deeper analysis of the system and subsequent modifications or refinements of the model will be needed.

An inadequate handling of two way communications is risky as serious objections to the validity of the model or to its conclusions, if not taken care off with zeal, could seriously hamper the model's usefulness. This might be the consequence either of objective errors in the model itself, or of erroneous interpretation of the model or of its conclusions. The first requires a correction of the model, the second must be dispelled with clarity as soon as possible to avoid a wide circulation of incorrect points of view which might make impact on the audience.

CONCLUSIONS.

Model builders and users have ample opportunity to improve the degree of diffusion of Systems' Dynamics models. An organized approach to obtain acceptance for models and for the conclusions obtained with their help may succeed in many cases. There is, however, no unique formula that could assure success in all situations. Each must be studied individually and an adequate strategy for model's and conclusions' acceptance must be developed.

It is probably correct to state that in some cases at least as much care and work is needed to obtain acceptance of the model as is needed to build it, validate it and use it. Without the model beimg accepted, however, the rest of the effort is usually lost for all practical purposes.