Combining program logic with scenario networks

Dennis List

Dennis List
dennis.list@unisa.edu.au
University of South Australia

Paper presented at the Australasian Evaluation Society 2004 International Conference 13-15 October-Adelaide, South Australia www.aes.asn.au

Abstract

This paper acts as a kind of matchmaker, introducing to each other two methods of planning (using the term broadly) that have previously been unacquainted with each other: program logic and scenario planning. Because each method has strengths that complement the weaknesses of the other, combining them may solve some recurring problems. Unlike program theory, the combined method (which I label scenario mapping) is designed to deal with conflicting goals and multiple stakeholders; and unlike scenario planning, scenario mapping can produce a set of traceable and scaleable possibilities. May the match be a fruitful union!

1. Introduction

Though scenario planning and program theory have different lineages, they share a concern with the unfolding of the future. However, they operate using different assumptions, and on different scales. Program theory is generally applied to a specific program or project, while scenario planning is normally applied at an industry or regional level. And while program theory examines the achievement of expectations, scenario planning attempts to reveal the diversity of the possible.

2. Scenario planning

In the last few decades, dissatisfaction with standard forecasting methods has led to a growth in the use of scenario planning. The quantitative emphasis of forecasting has led to the problem that what is measurable may not always continue to be relevant. Given the problems with forecasting, futurists' attention in the late 20th century turned to more holistic methods of anticipating the future, often for use as input for strategic planning. The most widely used of these methods is scenario planning, normally used in a time frame of between 5 and 20 years ahead (Schoemaker, 1993). The widely publicized successes of Shell Oil with its scenario planning (Wack, 1985; Schwartz, 1991) were instrumental in advancing the growth of scenario planning. For example, when the USSR gave up communism, Shell was already prepared for oil-trade arrangements with Moscow.

Scenario planning, unlike forecasting, is qualitative. Rather than predict the values of variables of current concern, it explores which variables (drawn from an infinite set) are likely to become relevant. It incorporates the principle that the future cannot be

known, but it can be anticipated. As multiple futures are possible, scenarios are always produced in sets - most commonly of around three or four scenarios.

There are many methods of generating scenarios, ranging from the intuitive insights of experts at one extreme, to more mathematical methods based on cross-impact analysis - in which thousands of possible combinations of trends and forces are rated for probability and impact. The most common method for producing scenarios is the "critical uncertainties" method, which involves identifying two to four dimensions on which uncertainty is strongest. The danger is of missing the point, by choosing dimensions that turn out not to be critical. Scenarios based on a slightly different set of critical uncertainties might have produced quite different futures, suggesting quite different anticipatory actions.

A new approach to scenario planning

Bearing in mind the limitations of traditional scenario planning, I have been developing a new approach, that serves a similar purpose, but is designed to overcome the most frequent problems. This approach uses scenario networks - similar to concept maps. Instead of the standard four or so scenarios (in the Shell tradition) there might be 100 nodes in a network. Each node is a miniature scenario: a transient situation. Its fruition is triggered by preceding nodes. There are multiple paths to and from each node, and multiple sets of situations that may trigger a node. The problematic concept of causality (cf. Davidson, 2000) is sidestepped by focusing on the mechanisms of enchainment (Abbott, 2001) and the epidemiological "web of causation" (Timmreck, 1998).

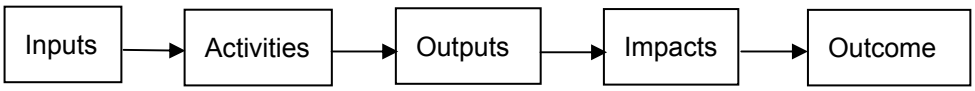
Some key elements of the scenario network approach are:

- A road-map analogy. Presenting the scenarios in the form of a diagram with links between the mini-scenarios enables systems to plot their progression through time on the network, to help determine what policy changes might be needed.
- A morphological approach (Ritchey, 1998). This entails considering all logical possibilities. Most crudely, for an organization, the possibilities are whether it will continue to exist or not, and whether its functions will still be performed in the same way, or whether they will not be performed.
- As the complexity of scenario networks can become overwhelming, there is a need to have some way of arranging them. One solution lies in the concept of the holon: defined by Koestler (1967) as a system that can be viewed simultaneously as a whole, an assembly of sub-systems, or part of a larger system. Classifying nodes into holons, and minimizing the links between holons while maximizing the links within holons, makes it possible to see the wood for the trees. On reviewing the scenario network a few years later, nodes that no longer seem relevant can be combined into single holons, while nodes of expanding detail can be separated into several distinct holons.
- A participative approach to construction of models. Scenarios are typically created by experts, then presented to industry members for fleshing out. Sometimes the industry participants don't understand all implications, and the critical uncertainties chosen by the experts may not apply in a particular situation. Scenario networks, in contrast, are more detailed, and therefore must be fleshed out by people working in the organization or industry. Though this is more time-consuming, the resulting quality of understanding among those involved is higher.

Such a network can be viewed as an outline of the future, showing how sets of events are likely to flow from previous sets of events. I have been developing this approach to scenarios for the last few years; further details are provided in List (2003).

3. Program theory

Program theory seems to have originated with the Logical Framework Approach developed in the 1960s for international development projects, and now widely used for that purpose. Around the 1980s came Program Logic Models (till recently, used most in the evaluation of programs in health or education). Program logic models, on which this article is focusing, are produced in a wide variety of different forms, as discussed by McLaughlin and Jordan (1999), with this common basis. A program is defined as a sequence of objectives. Usually the designers begin with an desired outcome in mind, and work back from that goal to determine what must be done to accomplish it. To achieve that outcome, some intermediate goals (impacts) must first be reached. To attain those impacts, the program must produce some outputs. To produce the outputs, activities are required. And in order to do the activities, inputs or resources are needed. A simplified form of the sequence can be shown thus:

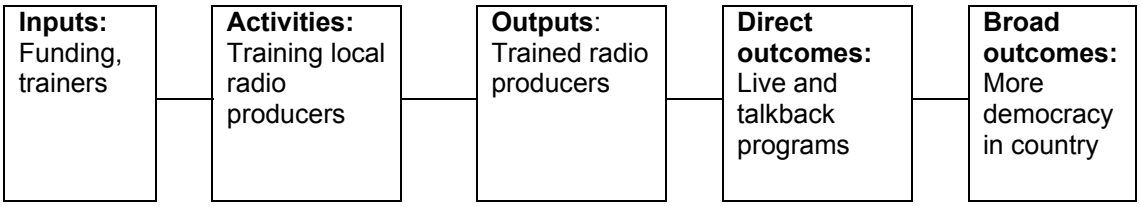


To confuse the uninitiated, the labels "impacts" and "outcomes" for the short-term and long-term objectives are sometimes reversed. To avoid confusion, I prefer to think of these as direct and broad outcomes – because sometimes the division is arbitrary. The diagram is represented as a chain, implying that no stage can occur until all previous stages are complete. (A solution to this obvious weakness is presented below.)

The simplicity of the above diagram conceals its power - in two ways:

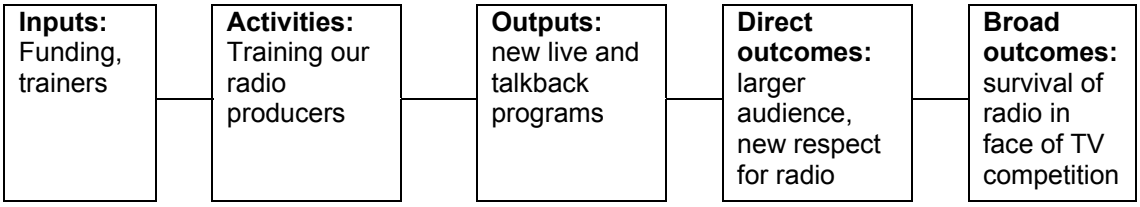
1. For those planning a program, to specify such a chain is a useful exercise. It forces them to clarify their theory of action.
2. After the chain has been agreed, evaluation becomes much simpler (conceptually), because each step of the chain can be evaluated using the most relevant data for that stage, specifically…
   - Did the inputs (money and people's time, etc) result in the planned activities being performed? This can be evaluated from work logs and financial data.
   - To what extent did those activities produce the planned outputs? Data from the program can provide that detail.
   - To what extent did those outputs result in the planned direct outcomes? This area is the familiar territory of evaluation, involving surveys, experiments, etc.
   - And to what extent did those direct outcomes (if achieved) produce the desired broad outcomes? This too is a standard evaluation question, but usually the most difficult to answer. Official statistics are often used at this point.

As a simple example, take a project I worked on over several years, with public broadcasters in a developing country. The activity was the introduction of live radio and talkback programs on the government radio network. The inputs were funding and training expertise, provided by an international agency. The activity was training local radio producers in the principles of live and talkback radio. The output was trained producers. The direct outcomes were the new programs they broadcast. The desired broad outcome (by the funding agency) was improved democracy:



(In fact, this project, like most international development work, used the Logical Framework approach, but I have re-expressed it as a program logic model.)

Note that the above logic model was described from the donor's point of view. Though the local view of the inputs and activities would be much the same, the later stages could be seen quite differently. It would be plausible to view the end-goal of the radio network as survival in the face of increased public focus on television, achieved by achieving an intermediate goal of a new, slicker style of radio programming. From a broader point of view still, it would be possible to see the end goal as educating the public in the possibilities of consumer choice. This in turn could lead to greater transparency in government and business, democratic involvement with the political process, and increased awareness of the power of consumerism.



The crucial point here (as with logic models in general) is that from each actor's point of view, the model would be somewhat different. Thus when a donor and recipient have different models, they might both commission evaluations, which might not concur on the program's achievements.

The further to the right in the sequence, the more difficult it becomes to relate inputs to outputs, or causes to effects. To begin at the left: did providing the resources result in the desired activities? Simple clerical work could answer that question. But whether the outputs of the project - regular live radio programs with talkback - actually led to increased democracy is much more elusive to measure. As this project was only one of many factors in the westernization of the country, how could its contribution to enhanced democracy be accurately assessed? At the right-hand end of the chain, definitions and assumptions become crucial: a small change in the definition of an end-goal might result in a large change in the evaluated success of a project. Funnell's (1997) cascading approach to program logic could help here: her position is that a project may not produce its intended broad outcomes unless specific interventions are used to assist in their accomplishment. In practice, a program will often involve multiple activities, with multiple inputs and outputs, all intended to work on multiple target groups towards the same end-goal. For example, how would those talkback radio programs contribute to democracy? There might be several different types of impact from a regular talkback program. (Here, the output is defined from the Vietnamese point of view: i.e. the production of a regular radio program.)

1. Members of the public would listen to the talkback programs, and perhaps hear others questioning or criticizing government or business actions.

2. They would come to accept the principle that actions affecting all citizens are accountable to all citizens.
3. This would embolden some of the listeners to do take part in talkback programs themselves.
4. Officials would know about the program, and perhaps think twice about going ahead with some project of dubious democratic merit, for fear of being criticized on air. (They might also use such programs in numerous other ways.)
5. Elected representatives would take up some of the themes mentioned on the programs, in an attempt to be returned to office in the next election.

In those five ways, outputs might achieve short-term or long-term goals. Each result can be enumerated using the most appropriate methodology, e.g.

Criterion to be evaluated	Method of evaluation
Program audience size, and listeners' awareness of content	A survey, designed to measure the program's audience
Acceptance of principle that official actions are accountable to all citizens	Qualitative research, e.g. consensus groups
Listeners take part in talkback programs	Radio station keeps records of the number of people calling talkback program
Officials hesitate to make undemocratic decisions	Perhaps through "before" and "after" surveys of officials
Elected representatives take up themes mentioned on the programs	Content analysis of parliamentary speeches and political news releases

But the question of how far those types of activity (even when enumerated) contribute to the enhancement of democracy is very much a political one, the answer to which will be largely determined by the definitions adopted for the final stage of the logic model.

Program theory has limitations: some intrinsic, and others arising from the context in which it is normally executed...

- No account is taken of unintended consequences - though every program has side-effects.
- Program logic focuses on a single issue - as intended by the program's managers.
- It conflates goal hierarchy and time sequence, and thus lacks feedback provision.
- It does not address issues of power, control, and participation - experts intervene with a "target group," seen as passive.
- Program logic does not deal with conflict - because it addresses only the program owner's needs.
- Doubtful generalizability, or the "black box problem" - an unclear connection between outputs and outcomes.

Having examined some of the strengths and weaknesses of program logic, and a variant of scenario planning that shares some properties with program logic models, let's consider how some combination of the two might be useful.

4. Introducing scenario planning to program theory

If the underlying image of PLM is that of a well-oiled machine designed to perform its intended function without fuss, the underlying image of a scenario is a leaking yacht on a wild sea: if it can reach any port at all, it will be lucky. Life encompasses both images: as Machiavelli (1525) pointed out, human futures are partly created by their participants, and partly by uncontrollable external influences. Specifically, inputs and

activities are more influenced by planning, while outcomes are more influenced externally. Thus a more comprehensive way of viewing and evaluating the future would be to combine the implicit viewpoints of program logic and scenario planning.

When a set of network scenarios is displayed in the same graphical way as a program logic model with branching, the two approaches can be very similar. Both may work back from a desired endpoint to the present, and both may involve a wide range of stakeholders in building a model. The deductive approach of program theory can complement the inductive approach of scenario planning. Many of the weaknesses of program theory (as listed above) do not apply to scenario planning, with its focus on "what *could* happen" as opposed to program theory's "what *should* happen." Likewise, some of the weaknesses of scenarios (such as fuzziness), are tempered when logic modelling is used. My suggestion, therefore, is that the scenario network approach can be applied to logic models, at both planning and evaluation stages:

1. The planning and evaluability assessment stage of a logic model.

The scenario network method can be used to develop logic models with a different emphasis. The morphological approach can be used to address contingencies – for example the path that outcomes might take if some group of stakeholders does not co-operate as intended.

2. The evaluation stage of a logic model.

In the evaluation stage, the network created previously can be used to trace the paths that a program followed. The central question becomes not "To what extent did the program succeed?" but "In what ways did it succeed (or not)?" This resembles the goal-free approach of Scriven (1974), except that instead of a grounded approach, there exists a network of intentions and outcomes from which hypotheses can be developed.

To construct such a network, actors' logic models are combined, then a process I call "weaving" creates a set of links between possible causes and possible effects. An combined approach would have these properties...

- A logic model for each actor group, with these models then linked to form a joint model of the possibility-space. (For actors without an explicit model, an implicit model can be developed, as explained below.)
- It would provide for multiple paths to a goal. Replacing the simple chain of the standard logic model, this would be a two-dimensional network, with branching: multiple inputs for a given output, and vice versa, as applicable.
- Unintended effects would be anticipated from the beginning of the project, and incorporated in the preliminary model.
- The values of all actors would be explicitly considered. Thus a model of this type needs to be developed participatively, including a wide range of actors.
- The focus would be more on the arrows in the influence diagrams, not on the boxes. The arrows would represent the mechanisms of change (Pawson & Tilley, 1997)

This combined approach could be called a scenario logic model. It can be created by following these steps:

1. Specify each group of actors - i.e. all groups who may have some influence on the outcome, or are likely to be influenced by it. Note that these are roles, not individuals (who may belong to several actor groups).

For each actor group:

2. Specify their likely logic model (which may be implicit).

3. To what extent are their goals congruent with the program's planned outcomes? An angular scale is useful here. Wholehearted acceptance is shown at 0 degrees, total opposition at 180, grudging acceptance at maybe 45, and passive resistance at say 135 degrees. Thus a polar graph of stakeholders can be drawn, with congruence of purpose shown as decreasing distance from the centre.
4. How strongly, and in what ways, is this group likely to react to the execution of the program?

With the addition of these other actors' logic models, the chain is transformed into a network.

Those who are relatively powerless, unable to organize inputs and activities to produce outcomes that affect their own social position, will not be creating logic models. For such groups, a sensible reaction is to use a scenario network approach. This could be labelled "flexibility" - or alternatively "opportunism". This involves, whenever a choice becomes available, taking the alternative that the actors believe will be most likely to enhance the attainment of their objectives. Such an approach would take into account the prevalent bias of over-optimism - as found by Kahnemann and Tversky in their extensive series of studies (e.g. Kahnemann, Slovic, and Tversky, 1982).

Example of a scenario logic model

Let's create a scenario logic model by continuing the radio example, using four actor groups (More could be distinguished, but I'll keep this example simple.) Two of those groups are the funding agency and the radio network, whose logic models have already been described. Two more broad actor groups are the total radio audience, and the government (all institutions combined).

For the radio audience, the logic model is implicit, because they have no particular plan of action in relation to radio listening. Assuming that their long-term goal is to improve their quality of life, the key questions would be: (a) how could talkback radio help with this? and (b) how congruent is it with the funder's goal of increased democracy? The answers could be: (a) by increasing the power of citizens relative to the government, and (b) correlated at around 45 degrees.

For the government, the logic model is more explicit, at least in terms of inputs, activities, and outputs. Outcomes are less clear, and in this country there may be a clear difference between outcomes espoused as desirable (e.g. communal values and national independence) and outcomes pursued in practice (e.g. economic development). Government officials, though perhaps welcoming more democracy in principle, might be uncomfortable with the idea of talkback radio, because it might hinder their activities. Thus the angle of agreement could be about 45 degrees. However, because the program has a stamp of social approval, the reaction of most officials, if asked to appear on talkback programs, could be to co-operate, but with some reserve.

The above statements are assumptions, but in a real situation they could be empirically established. Summing up these assumptions, all angles of co-operation are roughly in the same direction, so the program is likely to be a success - at least in terms of outputs and short-term outcomes. However, because of the intangibility of the desired long-term outcome of "increased democracy", combining the logic models is not enough to

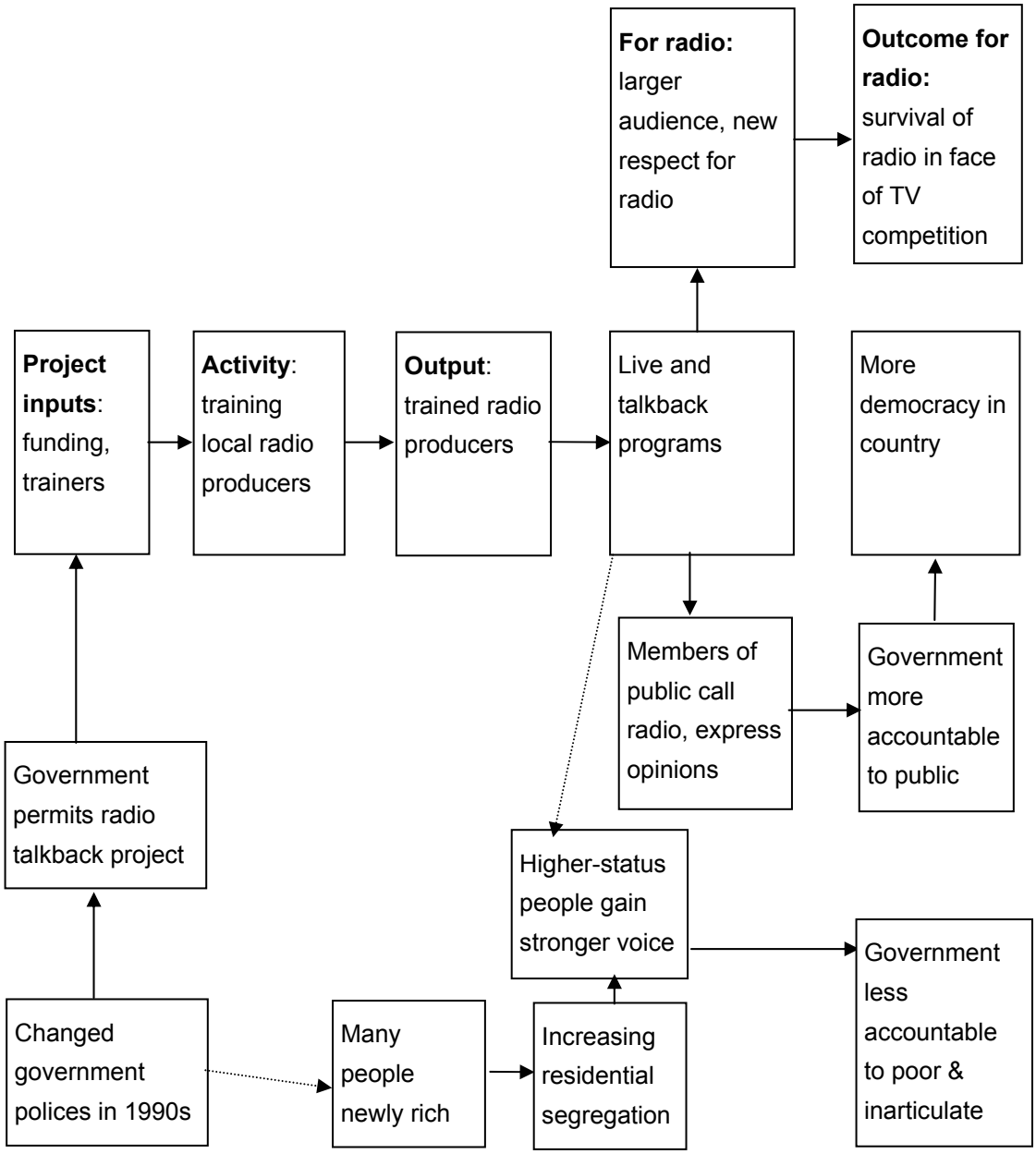
prospectively evaluate its success. For that, more information needs to be added, by alternating between activities and their likely outcomes.

I have been experimenting with a "weaving" approach to construct purposive scenario networks – working back and forth between activities and their expected consequences. Going back (in the logic model) we can ask "What other activities might have contributed to this effect?" Going forward again from each of those other activities, we can ask "What other consequences could that activity have?" The result can be a diagram that surrounds the original logic chain with a network of "other causes" and "other effects." In the last few sections, the reader may have noticed a change in emphasis: the focus has been moving away from outcomes as facts and intentions, toward outcomes as contingent possibilities. This reflects a crossing of the porous boundary between logic modelling and scenario networks.

The example reworked

Continuing the radio example, we can focus on one intended short-term outcome of the project: that people would telephone the talkback program to voice their opinions. The intended outcome might be that officials would hear the "voice of the people" directly. An unintended outcome is that, because most households do not yet have telephones, the opinions expressed on talkback radio are likely to come from wealthier households, and people with access to business phones (mainly professional and administrative workers). If those atypical opinions are then acted on, the result will be more representation for those with telephones, and relatively less representation for those without telephones - e.g. poorer households, elderly people, rural dwellers, and the less educated.

How else could the same outcome be achieved without talkback radio? (This is the backward step of the weaving: working back from an unintended outcome to another output.) One possibility is increasing residential segregation: since the 1990s, this country's cities appear to be dividing into richer and poorer areas. Because officials tend to live in richer areas, they are likely to have more contact with their neighbours than with people in poorer areas, and thus interpret their expressed experiences as typical. So this effect could occur even in the absence of talkback radio. Based on the above example, and adding a few plausible links, a scenario logic network could look like the following diagram, with intended consequences shown as solid lines and unintended consequences as dotted lines at oblique angles.



From this diagram, one could argue that both the aid project and its outcomes spring from that country's 1990s policy of deregulation. But because the diagram is far from comprehensive in the policy area, there must be both other sources and other consequences. That illustrates the main problem with scenario logic networks: with a little imagination, "causes" and "effects" can be added almost forever. With hindsight, one often sees that events that seemed almost trivial at first can have far-reaching ramifications. To help foresee these, two methods are useful: the "weaving" described above, and a critical examination of the assumptions embodied in the arrows. They are unlabelled in the diagrams above, and the implication is that they show causality. But as Davidson (2000) and others have shown, causality can have many shades of meaning. Methods such as Causal Layered Analysis (Inayatullah 1998, List 2003) can help to uncover implicit assumptions and detect underlying forces.

5. Conclusion

In this paper, I have outlined an extension of program logic modelling that can provide a more comprehensive view of the circumstances surrounding the implementation of a program than can either of the two methods from which it was derived: program theory and scenario planning. Though some practical aspects of the method are still to be ironed out, it has the potential for performing the two broad functions of program theory (planning and evaluation), as well as in prospective evaluation. The method is being further developed, using an iterative process involving repeated cycles of action research, incorporating a wide range of different programs, scales, and situations. Though this method is more complex than a program logic approach, it has the potential advantage of helping to keep programs on track when unplanned events occur. If this method has one key practical implication, it is the importance of taking other actors into account when planning or evaluating a program, in a structured way that enables hypotheses and assumptions to be clearly identified.

References

Davidson, J 2000, "Ascertaining causality in theory-based evaluation". In Rogers P et.al. (eds), Program theory in evaluation: Challenges and opportunities (pp.5-13). New Directions for Evaluation, no. 87, Jossey-Bass, San Francisco.

Funnell, S 1997, "Program logic: an adaptable tool for designing and evaluating programs". Evaluation News and Comment, vol.6 no.1 pp.5-17.

Inayatullah, S 1998, "Causal Layered Analysis: Poststructuralism as Method", Futures, vol.30, no.8, pp.815-829.

Kahnemann, D, Slovic, P & Tversky, A 1982, Judgment under uncertainty: Heuristics and biases. Cambridge University Press, New York.

Koestler, A 1967, The Ghost in the Machine. Hutchinson, London.

List, D 2003, "Three maps for navigating the ocean of alternative futures". Journal of Futures Studies, vol.8, no.2, pp.55-64.

List, D 2004, "Multiple pasts, converging presents, and alternative futures". Futures, vol.36, no.1, pp.23-43.

McLaughlin, J & Jordan, G 1999, "Logic models: a tool for telling your program's performance story". Evaluation and Program Planning, vol.22, no.1, pp.65-72.

Montague, S 1994, "The Three Rs of Performance-Based Management", Focus, December/January 1994, pp.26-28.

Pawson, R & Tilley , N 1997, Realistic Evaluation. Sage, London.

Ritchey, T 1998, "Morphological Analysis - a general method for non-quantified modeling". Brussels: 16th Euro-Conference on Operational Analysis.

Sartorius, R 1991, "The Logical Framework Approach to project design and management". Evaluation Practice, vol.12, no.2, pp.139-147.

Schoemaker, P 1993, "Multiple Scenario Development: its Conceptual and Behavioral Foundation". Strategic Management Journal, vol.14, pp.193—213.

Schwartz, P 1991, The Art of the Long View. Doubleday Currency, New York.

Scriven, M 1974, "Evaluation perspectives and procedures", in Popham, W (ed), Evaluation in Education: Current Applications (pp.68-84). McCutchan, Berkeley, USA.

Wack, P 1985a, "Scenarios: Uncharted Waters Ahead", Harvard Business Review, vol.63 no.5, pp.72-79.

Wack, P 1985b, "Scenarios: Shooting the Rapids", Harvard Business Review, vol.63, no.6, pp.139-150.

Weiss, C 1997, Theory-Based Evaluation: Past, Present, and Future. New Directions for Evaluation, no. 76. Jossey-Bass, San Francisco.