Logic models: a tool for telling your program's performance story

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Abstract

Program managers across private and public sectors are being asked to describe and evaluate their programs in new ways. People want managers to present a logical argument for how and why the program is addressing a specific customer need and how measurement and evaluation will assess and improve program effectiveness. Managers do not have clear and logically consistent methods to help them with this task. This paper describes a Logic Model process, a tool used by program evaluators, in enough detail that managers can use it to develop and tell the performance story for their program. The Logic Model describes the logical linkages among program resources, activities, outputs, customers reached, and short, intermediate and longer term outcomes. Once this model of expected performance is produced, critical measurement areas can be identified. © 1999 Elsevier Science Ltd. All rights reserved.

Keywords: Program theory; Program modeling; Performance measurement; Monitoring and evaluation; Government Performance and Results Act

1. The problem

"At its simplest, the Government Performance and Results Act (GPRA) can be reduced to a single question: What are we getting for the money we are spending? To make GPRA more directly relevant for the thousands of Federal officials who manage programs and activities across the government, GPRA expands this one question into three: What is your program or organization trying to achieve? How will its effectiveness be determined? How is it actually doing? One measure of GPRA's success will be when any Federal manager anywhere can respond knowledgeably to all three questions."
John A. Koskinen, 1997
Office of Management and Budget

Federal managers were being challenged by Mr Koskinen (1997), Deputy Director of the OMB, to tell their program's story in a way that communicates not only the program's outcome goals, but also that these outcomes are achievable. For many public programs there is also an implicit question: 'Are the results proposed by the program the correct results?' That is, do the results address problems appropriate for the program and deemed by stakeholders to be important to the organizational mission and national needs?

The emphasis on accountability and 'managing for results' is found in state and local governments as well as in public service organizations such as the United Way of America and the American Red Cross. It represents a change in the way managers have to describe their programs and document program successes. Program managers are not as familiar with describing and measuring outcomes as they are with documenting inputs and processes. Program design is not necessarily explicit, in part because this allows flexibility should stakeholder priorities change.

There is also an increasing interest among program managers in continuous improvement and managing for 'quality'. Choosing what to measure and collecting and analyzing the data necessary for improvement measurement is new to many managers.

The problem is that clear and logically consistent methods have not been readily available to help program managers make implicit understandings explicit. While tools such as flow charts, risk analysis, systems analysis, are used to plan and describe programs, there is a method developed by program evaluators that more comprehensively addresses the increasing requirements for both outcome measurement and improvement measurement.

Our purpose here is to describe a tool used by many in the program evaluation community, the Logic Model process, to help program managers better meet new

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requirements. Documentation of the process by which a manager or group would develop a Logic Model is not readily available even within the evaluation community, thus the paper may also help evaluators serve their customers better.

2. The Program Logic Model

Evaluators have found the Logic Model process useful for at least twenty years. A Logic Model presents a plausible and sensible model of how the program will work under certain conditions to solve identified problems (Bickman, 1987). Thus the Logic Model is the basis for a convincing story of the program's expected performance. The elements of the Logic Model are resources, activities, outputs, customers reached, short, intermediate and longer term outcomes, and the relevant external influences (Wholey, 1983, 1987).

Descriptions and examples of the use of Logic Models can be found in Wholey (1983), Rush & Ogborne (1991), Corbeil (1986), Jordan & Mortensen (1997), and Jordan, Reed, & Mortensen (1997). Variations of the Logic Model are called by different names, 'Chains of Reasoning' (Torvatn, 1998), Theory of Action, (Patton, 1997), and 'Performance Framework' (Montague, 1997; McDonald & Teather, 1997). The Logic Model and these variations are all related to what evaluators call program theory. According to Chen (1990), program theory should be both prescriptive and descriptive. That is, a manager has to both explain the elements of the program and present the logic of how the program works. Patton (1997) refers to a program description such as this as an 'espoused theory of action', that is, stakeholder perceptions of how the program will work.

The benefits of using the Logic Model tool include:

- Builds a common understanding of the program and expectations for resources, customers reached and results, thus is good for sharing ideas, identifying assumptions, team building, and communication;
- Helpful for program design or improvement, identifying projects that are critical to goal attainment, redundant, or have inconsistent or implausible linkages among program elements; and,
- Communicates the place of a program in the organization or problem hierarchy, particularly if there are shared logic charts at various management levels;
- Points to a balanced set of key performance measurement points and evaluation issues, thus improves data collection and usefulness, and meets requirement of GPRA.

A simple Logic Model is illustrated in Fig. 1.
Resources include human and financial resources as well as other inputs required to support the program such as partnerships. Information on customer needs is an essential resource to the program. *Activities* include all those action steps necessary to produce program outputs. *Outputs* are the products, goods and services provided to the program's direct *customers*. For example, conducting research is an activity and the reports generated for other researchers and technology developers could be thought of as outputs of the activity.

Customers had been dealt with implicitly in Logic Models until Montague added the concept of *Reach* to the performance framework. He speaks of the 3Rs of performance: resources, people reached, and results (Montague, 1997, 1994). The relationship between resources and results cannot happen without people— the customers served and the partners who work with the program to enable actions to lead to results. Placing customers, the users of a product or service, explicitly in the middle of the chain of logic helps program staff and stakeholders better think through and explain what leads to what and what population groups the program intends to serve.

Outcomes are characterized as changes or benefits resulting from activities and outputs. Programs typically have multiple, sequential outcomes across the full program performance story. First, there are *short term outcomes*, those changes or benefits that are most closely associated with or 'caused' by the program's outputs. Second, there are *intermediate outcomes*, those changes that result from an application of the short term outcomes. *Long term outcomes* or program impacts, follow from the benefits accrued though the intermediate outcomes. For example, results from a laboratory prototype for an energy saving technology may be a short-term outcome; the commercial scale prototype an intermediate outcome, and a cleaner environment once the technology is in use one of the desired longer term benefits or outcomes.

A critical feature of the performance story is the identification and description of *key contextual factors* external to the program and not under its control that could influence its success either positively or negatively. It is important to examine the external conditions under which a program is implemented and how those conditions affect outcomes. This explanation helps clarify the program 'niche' and the assumptions on which performance expectations are set. Doing this provides an important contribution to program improvement. (Weiss, 1997). Explaining the relationship of the problem addressed through the program, the factors that cause the problem, and external factors, enables the manager to argue that the program is addressing an important problem in a sensible way.

3. Building the Logic Model

As we provide detailed guidance on how to develop a Logic Model and use it to determine key measurement
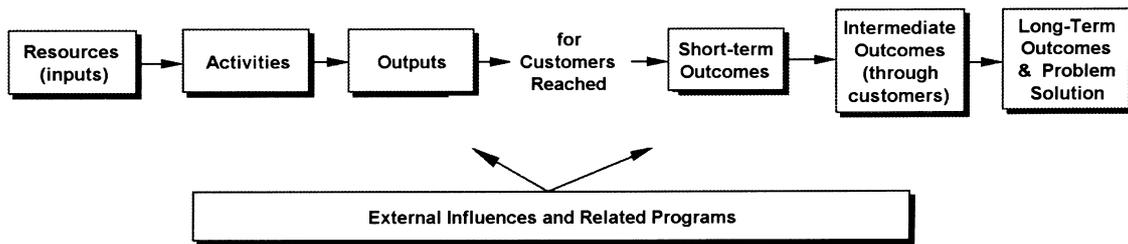
Fig. 1. Elements of the Logic Model.

and evaluation points, it will become more clear how the Logic Model process helps program managers answer the questions Mr. Koskinen and others are asking of them. An example of a federal energy research and technology development program will be used throughout. Program managers in the U.S. Department of Energy Office of Energy Efficiency and Renewable Energy have been using the Logic Model process since 1993 to help communicate the progress and value of their programs to Congress, partners, customers, and other stakeholders.

The Logic Model is constructed in five stages discussed below. Stage 1 is collecting the relevant information; Stage 2 is describing the problem the program will solve and its context; Stage 3 is defining the elements of the Logic Model in a table; Stage 4 is constructing the Logic Model; and Stage 5 is verifying the Model.

3.1. Stage 1: collecting the relevant information

Whether designing a new program or describing an existing program, it is essential that the manager or a work group collect information relevant to the program from multiple sources. The information will come in the form of program documentation, as well as interviews with key stakeholders both internal and external to the program. While Strategic Plans, Annual Performance Plans, previous program evaluations, pertinent legislation and regulations and the results of targeted interviews should be available to the manager before the Logic Model is constructed, as with any project, this will be an iterative process requiring the ongoing collection of information. Conducting a literature review to gain insights into what others have done to solve similar problems, and key contextual factors to consider in designing and implementing the program, can present powerful evidence that the program approach selected is correct.

Building the Logic Model for a program should be a team effort in most cases. If the manager does it alone, there is a great risk that parts viewed as essential by some will be left out or incorrectly represented. In the following steps to building the Logic Model we refer to the manager as the key player. However, we recommend that persons knowledgeable of the program's planned performance, including partners and customers, be involved in a work group to develop the Model. As the building process

begins it will become evident that there are multiple realities or views of program performance. Developing a shared vision of how the program is supposed to work will be a product of persistent discovery and negotiation between and among stakeholders.

In cases where a program is complex, poorly defined, or communication and consensus is lacking, we recommend that a small subgroup or perhaps an independent facilitator be asked to perform the initial analysis and synthesis through document reviews and individual and focus group interviews. The product of this effort can then be presented to a larger work group as a catalyst for the Logic Model process.

3.2. Stage 2: clearly defining the problem and its context

Clearly defining the need for the program is the basis for all that follows in the development of the Logic Model. The program should be grounded in an understanding of the problem that drives the need for the program. This understanding includes understanding the problems customers face and what factors 'cause' the problems. It is these factors that the program will address to achieve the longer term goal—working through customers to solve the problem. For example,

> There are economic and environmental challenges related to the production, distribution, and end use of energy. U.S. taxpayers face problems such as dependence on foreign oil, air pollution, and threat of global warming from burning of fossil fuels. Factors that might be addressed to increase the efficiency of end use of energy include the limited knowledge, risk aversion, budget constraints of consumers, the lack of competitively priced clean and efficient energy technologies, the externalities associated with public goods, and restructuring of U.S. electricity markets. To solve the problem of economic and environmental challenges related to the use of energy, the program chooses to focus on factors related to developing clean and efficient energy technologies and changing customer values and knowledge. In this way, the program will influence customer use of technologies that will lead to decreased use of energy, particularly of fossil fuels.

One of the greatest challenges faced by work groups

developing Logic Models is describing where their program ends and others start. For the process of building a specific program's Logic Model, the program's performance ends with the problem it is designed to solve with the resources it has acquired, including the external forces that could influence its success in solving that problem. Generally, the manager's concern is determining the reasonable point of accountability for the program. At the point where the actions of customers, partners, or other programs are as influential on the outcomes as actions of the program, there is a *shared responsibility* for the outcomes and the program's accountability for the outcomes should be reduced. For example, the adoption of energy efficient technologies is also influenced by financiers and manufacturers of those technologies.

3.3. Stage 3: defining the elements of the Logic Model

3.3.1. Starting with a table

Building a Logic Model usually begins with categorizing the information collected into 'bins', or columns in a table. Using the categories discussed above the manager goes through the information and tags it as a resource, activity, output, short term outcome, intermediate outcome, long term outcome or external factor. Since we are building a *model* of how the program works, not every program detail has to be identified and cataloged, just those that are *key* to enhancing program staff and stakeholder understanding of how the program works.

Figure 2 is a table with some of the elements of the Logic Model for a technology program.

3.3.2. Checking the logic

As the elements of the Logic Model are being gathered, the manager and a work group should continually check

the accuracy and completeness of the information contained in the table. The checking process is best done by involving representatives of key stakeholder groups to determine if they can understand the logical flow of the program from resources to solving the longer term problem. So the checking process goes beyond determining if all the key elements identified, to confirming that reading from left to right, there is an obvious sequence or bridge from one column to the next.

One way to conduct the check is to start in any column in the table and ask the question, 'How did we get here?' For example, if we select a particular short term outcome, is there an output statement that leads to this outcome? Or, for the same outcome, we could ask, 'Why are we aiming for that outcome?' The answer lies in a subsequent outcome statement in the intermediate or long term outcome columns. If the work group cannot answer either the how or why question, then an element needs to be added or clarified by adding more detail to the elements in question.

3.4. Stage 4: drawing the Logic Model

The Logic Model captures the logical flow and linkages that exist in any performance story. Using the program elements in the table, the Logic Model organizes the information, enabling the audience to understand and evaluate the hypothesized linkages. Where the resources, activities and outcomes are listed within their respective columns in the story, they are specifically linked in the Model, so that the audience can see exactly which activities lead to what intermediate outcomes and which intermediate outcomes lead to what longer term outcomes or impacts.

Although there are several ways to present the Logic

				Outcomes		
Resources	**Activities**	**Outputs**	**Customer Reached**	**Short Term**	**Intermediate Term**	**Long Term**
- Budget $XXX - #/ capabilities of staff - #/size of partners - Cost share $ - Technology Roadmap - # of years experience	- Fund grants (solicit, review, etc.) - Research properties of materials - Provide technical assistance - Set policy for procurement	- #/type of awards - R&D progress reports - Lab and commercial prototypes - Advice provided - $ procure-mnt affected	- Federal and private researchers - Industrial firms impacted -Manufacturers -Existing/future consumers of related products	- Rejectees seek venture capital - R&D advances made - Lab prototype started; results documented -Tech roadmap revised - Advice considered	- Some get venture capital - Lab prototype completed; - Commercial designed -More efficient processes adopted - Technology purchased	Reduction in energy use means lower costs, more competitive, emissions from energy are less, thus environment cleaner

External Influences: Price of oil and other energy supply and distribution factors, economic growth, perception of risk of global climate change, market assumptions, technology assumptions

Fig. 2. A table with elements of the Logic Model for an energy technology program.

Model (Rush & Ogborne, 1991; Corbeil, 1986) the Logic Model is usually set forth as a diagram with columns and rows, with the abbreviated text put in a box and linkages shown with connecting one-way arrows. We place inputs or resources to the program in the first column at the left of the Model and the longer term outcomes and problem to be solved on the far right column. In the second column, the major program activities are boxed. In the columns following activities, the intended outputs and outcomes from each activity are shown, listing the intended customer for each output or outcome. An example of a Logic Model for an energy efficiency research and development program is depicted in Fig. 3.

The rows are created according to activities or activity groupings. If there is a rough sequential order to the activities, as there often is, the rows will reflect that order reading from top to bottom of the diagram. This is the case if the accomplishments of the program come in stages as demonstrated in our example of the if, then statements. When the outcomes from one activity serve as a resource for another activity chain, an arrow is drawn from that outcome to the next activity chain. The last in the sequence of activity chains could describe the efforts of external partners, as in the example in Fig. 3. Rather than a sequence, there could be a multi-faceted approach with several concurrent strategies that tackle a problem. For example, a program might do research in some areas and technology development and deployment in others, all working toward one goal such as reducing energy use and emissions.

Although the example shows one-to-one relationships among program elements, this is not always the case. It may be that one output leads to one or more different outcomes, all of which are of interest to stakeholders and are part of describing the value of the program.

Activities can be described at many levels of detail. Since models are simplifications, activities that lead to the same outcome(s) may be grouped to capture the level of detail necessary for a particular audience. A rule of thumb is that a Logic Model would have no more than five activity groupings. Most programs are complex enough that Logic Models at more than one level of detail are helpful. A Logic Model more elaborate than the simple one shown in Figure 1 can be used to portray more detail for all or any one of its elements. For example, research activities may include literature reviews, conducting experiments, collecting information from multiple sources, analyzing data, and writing reports. These can be grouped and labeled research. However, it may be necessary to formulate a more detailed and elaborate description of research sub activities for those staff responsible and if this area is of specific interest to a stakeholder group. For example, funding agencies might want to understand the particular approach to research that will be employed to answer key research questions.

The final product may be viewed as a network displaying the interconnections between the major elements of the program's expected performance, from resources to solving an important problem. External factors are entered into the Model at the bottom, unless the program has sufficient information to predict the point at which they might occur.
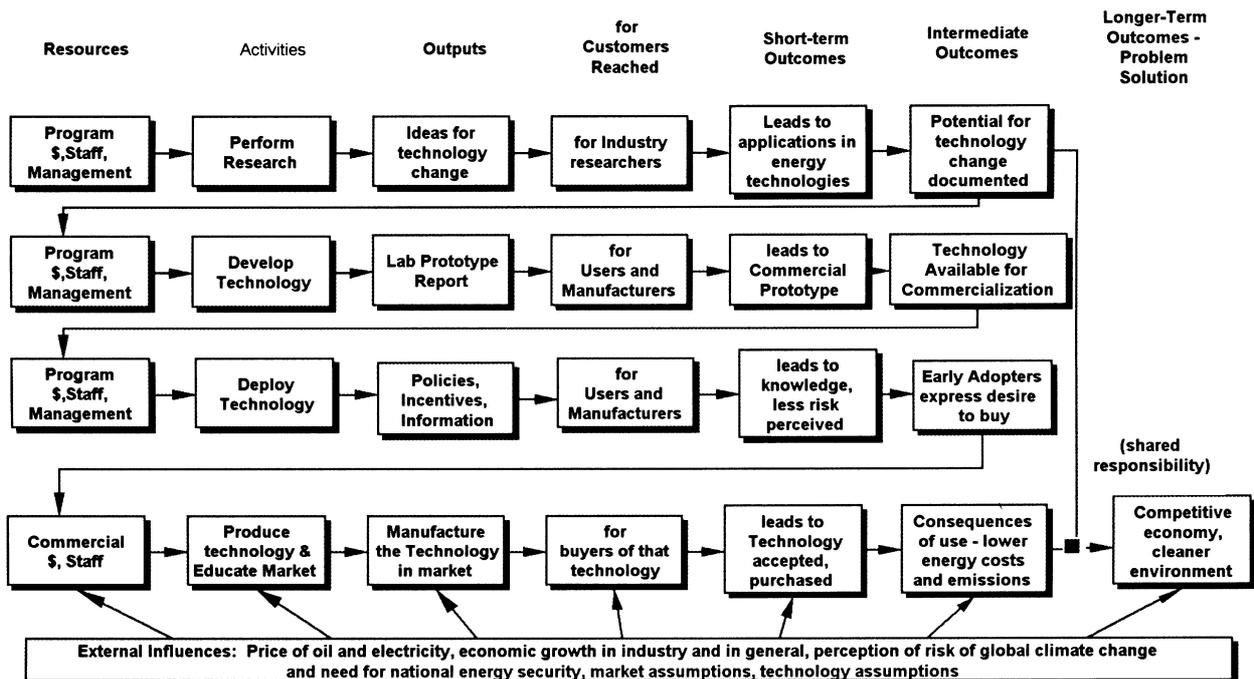

Fig. 3. Logic chart for a research and technology development and deployment program.

3.5. Stage 5: verifying the Logic Model with stakeholders

As the Logic Model process unfolds, the work group responsible for producing the Model should continuously evaluate the Model with respect to its goal of representing the program logic—how the program works under what conditions to achieve its short, intermediate, and long term aims. The verification process followed with the table of program logic elements is continued with appropriate stakeholders engaged in the review process. The work group will use the Logic Model diagram(s) and the supporting table and text. During this time, the work group can address what critical information they need about performance, setting the stage for a measurement plan.

In addition to the how-why and if-then questions, we recommend four evaluation questions be addressed in the final verification process:

(1) Is the level of detail sufficient to create understandings of the elements and their interrelationships?
(2) Is the program logic complete? That is, are all the key elements accounted for?
(3) Is the program logic theoretically sound? Do all the elements fit together logically? Are there other plausible pathways to achieving the program outcomes?
(4) Have all the relevant external contextual factors been identified and their potential influences described?

A good way to check the Logic Model is to describe the program logic as hypotheses; a series of if, then statements (United Way of America, 1996). Observations of key contextual factors provide the conditions under which the hypotheses will be successful. The hypothesis or proposition the work group is stating is: 'If assumptions about contextual factors remain correct and the program uses these resources with these activities, then it will produce these short-term outcomes for identified customers who will use them, leading to longer term outcomes.'

This series of if-then statements is implicit in Fig. 1. If resources, then program activities. If program activities, then outputs for targeted customer groups. If outputs change behavior, first short and then intermediate outcomes occur. If intermediate outcomes lead to the longer term outcomes, this will lead to the problem being solved.

For example, given the problem of limited energy resources, the hypothesis might go something like this:

Under the conditions that the price of oil and electricity increase as expected, *if* the program performs applied research, *then* it will produce ideas for technology change. *If* industry researchers take this information and apply it to energy technologies, *then* the potential for technology changes will be tested and identified. *If* this promising new knowledge is used by technology developers, *then* prototypes of energy efficient technologies can be developed. *If* manu-facturers use the prototypes and perceive value and low risk, *then* commercially available energy saving technologies will result. **If** there is sufficient market education and incentives and if the price is right, *then* consumers will purchase the new technologies. *If* the targeted consumers use the newly purchased technologies, *then* there should be a net reduction in the energy use, energy costs and emissions, thus making the economy more competitive and the environment cleaner.

4. Measuring performance

Measurement activities take their lead from the Logic Model produced by the work group. There are essentially two purposes to measure program performance: accountability or communicating the value of the program to others, and program improvement. When most managers are faced with accountability requirements, they focus on collecting information or evidence of their program's accomplishments—the value added for their customers and the degree to which targeted problems have been solved. Another way to be accountable is to be a good manager. Good managers collect the kind of information that enables them to understand how well their program is working. In order to acquire such an understanding, we believe that, *in addition* to collecting outcome information, the program manager has to collect information that provides a balanced picture of the health of the program. When managers adopt the program improvement orientation to measurement they will be able to provide accountability information to stakeholders, as well as make decisions regarding needed improvements to improve the quality of the program.

Measurement strategies should involve ongoing monitoring of what happened in the essential features of the program performance story and evaluation to assess their presumed causal linkage or relationships, including the hypothesized influences of external factors. Wiess (1997) citing her earlier work, noted the importance of not only capturing the program process but also collecting information on the hypothesized linkages. According to Wiess, the measurement should 'track the steps of the program'. In the Logic Model, the boxes are the steps that can often be simply counted or monitored, and the lines connecting the boxes are the hypothesized linkages or causal relationships that require in-depth study to determine and explain what happened.

It is the measurement of the linkages, the arrows in the logic chart, which allows the manager to determine if the program is working. Monitoring the degree to which elements are in place, *even the intended and unintended outcomes*, will not explain the measurement or tell the manager if the program is working. What is essential is the testing of the program hypotheses. Even if the man-

ager observes that intended outcomes were achieved, the following question must be asked, 'What feature(s), if any, of the program contributed to the achievement of intended and unintended outcomes?'

Thus, adopting the program improvement orientation to performance measurement requires going beyond keeping score. Earlier we referred to Patton's (1997) espoused theory of action. The first step in improvement measurement is determining whether what has been planned in the Logic Model actually occurred. Patton would refer to this as determining theories-in-use. Scheirer (1994) provides an excellent review of *process evaluation*, including not only methods for conducting the evaluation of how the program works, but also criteria to apply in the evaluation.

The Logic Model provides the hypothesis of how the program is supposed to work to achieve intended results. If it is not implemented according to design, then there may be problems reaching program goals. Furthermore, information from the process evaluation serves as explanatory information when the manager defends accountability claims and attributes the outcomes to the program.

Yin (1989) discusses the importance of pattern matching as a tool to study the delivery and impact of a program. The use of the Logic Model process results in a pattern that can be used in this way. As such it becomes a tool to assess program implementation and program impacts. An iterative procedure may be applied that first determines the theory-in-use, followed by either revisions in the espoused theory or tightening of the implementation of the espoused theory. Next, the resulting tested pattern can be used to address program impacts.

We should note that the verification and checking activities described earlier with respect to Steps 4 and 5 actually represent the first stages of performance measurement. That is, this process ensures that the program design is logically constructed, that it is complete, and that it captures what program staff and stakeholders believe to be an accurate picture of the program.

Solving the measurement challenge often requires stakeholder representatives be involved in the planning. Stakeholders and the program should agree on the definition of program success and how it will be measured. And often the program has to rely on stakeholders to generate measurement data. Stakeholders have their own needs for measurement data as well as constraints in terms of resources and confidentiality of data.

The measurement plan can be based on the logic chart(s) developed for the program. The manager or work team should use Logic Models with a level of detail that match the detail needed in the measurement. Stakeholders have different measurement needs. For example, program staff have to think and measure at a more detailed level than upper management.

The following are the performance measurement ques-

tions across the performance story which the manager and work team will use to determine the performance measurement plan:

(1) Is (was) each element proposed in the Logic Model in place, at the level expected for the time period? Are outputs and outcomes observed at expected performance levels? Are activities implemented as designed? Are all resources, including partners, available and used at projected levels?
(2) Did the causal relationships proposed in the Logic Model occur as planned? Is reasonable progress being made along the logical path to outcomes? Were there unintended benefits or costs?
(3) Are there any plausible rival hypotheses that could explain the outcome/result?
(4) Did the program reach the expected customers and are the customers reached satisfied with the program services and products?

A measurement plan will include a small set of critical measures, balanced across the performance story, that are indicators of performance. There may be strategic measures at a high level of detail, and tactical measures for implementers of the program. The plan will also include the important performance measurement questions that must be addressed and suggest appropriate timing for outcomes or impact evaluation. This approach to measurement will enable the program manager and stakeholders to assess how well the program is working to achieve its short term, intermediate, and long term aims and to assess those features of the program and external factors that may be influencing program success.

5. Conclusion

This paper has set forth for program managers and those who support them the Logic Model tool for telling the program's performance story. Telling the story involves answering the questions: 'What are you trying to achieve and why is it important?', 'How will you measure effectiveness?', and 'How are you actually doing?' The final product of the Logic Model process will be a Logic Model diagram(s) that reveals the essence of the program, text that describes the Logic Model diagram, and a measurement plan. Armed with this information the manager will be able to meet accountability requirements and present a logical argument, or story, for the program. Armed with this information, the manager will be able to undertake both outcomes measurement and improvement measurement. Because the story and the measurement plan have been developed with the program stakeholders, the story should be a shared vision with clear and shared expectation of success.

The authors will continue to search for ways to facilitate the use of the Logic Model process and convince

managers and stakeholders of the benefits of its use. We welcome feedback from managers, stakeholders, and facilitators who have tried this or similar tools to develop and communicate a program's performance story.

Acknowledgments

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