

## A Powerful Marriage: decision analysis and value engineering

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### ABSTRACT

The objective of this paper is to discuss the powerful thinking and management excitement that can be gained from the marriage of the probabilistic tools of decision analysis and the job plan of value engineering. Value engineers desiring to move closer to senior management must be able to communicate with them using their language and toolset. By blending decision analysis methodology and tools with the value management process, Value Engineers will be able to address senior management level issues such as strategic decisions and corporate portfolio applications using a language and process that senior managers understand and accept.

The marriage of Value Engineering and Decision Analysis provides an energizing and powerful approach for practitioners of both methodologies, and in doing so provides new opportunities for all practitioners.

### INTRODUCTION

The term "marriage" is used throughout this paper in deliberate way. Rather than using the more common business term "integration", this author uses marriage as a union that provides the ability for each process or "parent" to protect its identity and value, as well as having the opportunity to develop "offspring" processes, which carry traits from both parents. This paper addresses what each of the partners bring to the marriage, what can be gained by the marriage, where the link-

ages are, and what is needed to make the marriage work. In addition, the paper will also hypothesize on what the offspring may experience as a child, adolescent, and adult.

### THE PARENTS

This story begins with the introduction of each parent process, the value each brings, and how the marriage will be beneficial to both processes. The first partner in the marriage is Integrated Decision Management (IDM), also commonly known as decision analysis. It is "a methodology and set of probabilistic frameworks for facilitating high quality, logical discussions; illuminating difficult decisions, and leading to clear and compelling action by the decision maker"<sup>1</sup>. This process is being used today by a most of the Fortune 100 companies to make decisions ranging from corporate and business unit strategies to basic operating decisions such as choosing the right crude pump for a refinery<sup>2</sup>. However, the process is more frequently applied on strategic and high visibility projects, which has hurt its acceptance and usage by lower management levels for operational problems.

The IDM process is structured to help individuals and organizations make better decisions by:

- a) clearly understanding the problem,
- b) creating unique alternatives to compare and evaluate,
- c) gathering appropriate and adequate information to

- make the decision,
- d) consistently assessing each alternative as to its value and risk, and
- e) coming to a decision that is both clear and compelling based on the risk versus return.

The four separate and distinct stages in the IDM process are named Discovery, Framing, Evaluation, and Agreement. Each stage has its own set of deliverables and tools designed to create insight and clarity before proceeding to the next stage. At the end of each stage there is a work product review (quality check) with the decision-maker(s). These reviews ensure that the project is meeting the decision-maker's objectives and is an opportunity for the decision-maker to interject any insight or information. (See Figure 1 for a diagram of the Integrated Decision Management Process)

The process has gained widespread acceptance with management and has promoted its own "language" because of the clarity the process brings and its quantification of uncertainty and risk. Many terms such as tornado diagrams, decision trees, strategy tables, and influence diagrams have made their way into white papers and board rooms and are considered common place business terms. When the IDM process is driven by senior management who engage high priced consultants to perform the work, it can lead to the belief that the process is expensive and time consuming. While some projects can become lengthy and expensive, the majority of the projects that involve Decision Analysis are accomplished in a matter of days or weeks, not months by fully competent internal resources.

The key benefits from using this process are:

- a) clear identification of the problem,
- b) development of alternative courses of action,
- c) quantification of the value and risk of the alternatives, and

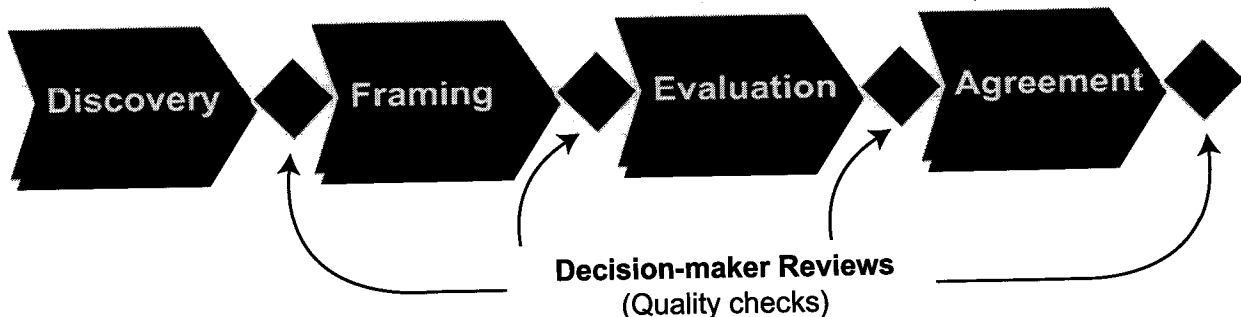
- d) a clear and compelling course of action.

Where the IDM process may experience difficulty is in optimizing the cost of a specific decision, in developing a clear functional description of a project, and in the transition from commitment to implementation. These are areas where Value Engineering may provide a more robust approach. While personal experience with value engineering is much more limited than with decision analysis, this author has been a user of the process as defined by Jerry Kaufman in his book *Value Management*. Jerry defines value management as "an organized effort that analyzes the functions of goods and services. It looks for ways to include the necessary functions and essential characteristics of the product while still operating in the most profitable manner. Value Management is a structured building-block process that makes a deliberate effort to identify what the market furnishes and what it actually needs."<sup>3</sup> The method of applying the process resides within the job plan and its five key steps of Information, Speculation, Planning, Execution, and Reporting. This structured approach is similar to decision analysis in the structure of clarifying the problem, developing creative ideas, evaluating those alternatives, and coming to agreement on the actions to be taken. Value engineering does this with the intent of increasing functionality while maintaining or hopefully decreasing the cost. This provides a means to deal with and optimize the tradeoff between function and cost. Unfortunately, it seems that this focus on the tradeoffs have promoted a view with management that it is only a cost reduction tool and as such is not intended for significant management decisions.

WHAT CAN BE GAINED BY THIS MARRIAGE?

Clearly there is a difference between value engineering and decision analysis in management interactions, focus, and deliverables. But these differences can be

Figure 1. The Integrated Decision Management Process



valuable, as in any marriage, where the synergy of two partners is greater than the sum. What many would view as the most obvious difference, is the audience for whom the results of the analysis are intended. From a stereotypical view decision analysis is only for senior management and value engineering is only for operational level management. While we know that this is untrue, it is a common belief held by clients and told to practitioners. Comments have been heard from value engineers that they wished they knew how to get senior management interested in value engineering, and even more so, on how to communicate what value engineers really do. Similarly, decision analysts complain about not being able to get operating managers to understand and use their process on operational problems because they think it takes too long and costs too much. The marriage of these two processes will provide the power and the clarity to overcome these key frustrations by both practitioners.

The focus and level of detail that each process is designed to provide is also significantly different. Decision analysis is designed to include only the information necessary to create a clear and compelling agreement on a course of action. It is not designed to look at the functionality of a project and therefore may explain why it has not gained more popularity with operational decisions. Value engineering on the other hand, is designed to focus on the functionality of a product or service, with the assumption that a decision has been made to proceed.

The final difference is in the deliverables of each process. Decision analysis provides its users with an in-depth understanding of the value and risk of a project at an appropriate level of detail for making a decision. This level of detail can create a situation that forgoes the opportunity to enhance or optimize the functionality of a selected alternative, whereas value engineering provides the user with an understanding of the potential value to be gained either by adding functionality, reducing cost, or both. But value engineering does not explicitly account for uncertainty and risk, or provide insight into the sensitivity of key uncertainties. These insights are considered important by senior management and need to be included in the process.

While the differences between the two processes are distinct, the common foundation that both processes have is in the search for better and more valuable alternatives to a problem. A quick conclusion at this point might indicate that value engineering would only come after the decision analysis results in a commitment to proceed with a project. However, there is a strong ar-

gument that using value engineering has significant merit before making a decision. By using value engineering to better define the functionality and characteristics of each alternative and using the decision analysis process to better define the elements of value and risk, a married process will provide a more robust choice for the decision-maker.

### WHERE ARE THE LINKAGES?

The marriage of the two processes provides an opportunity to incorporate new tools and techniques into the existing processes as well as develop an "offspring" process that may be more robust than either of the parents. Lets begin with what value engineering can add to decision analysis. The decision analysis process can greatly benefit from FAST (Function Analysis System Technique) diagramming to better understand the whole problem and more detail of the "how" and "why" of the problem. Decision analysis does have its own problem diagramming tool known as the influence diagram. It starts with the value criteria of the decision-maker and breaks the problem down into the key components of revenue and costs that contribute to value. Where FAST diagramming adds more power to decision analysis is in its detail on functions and systems, not just the decision. This will aid decision analysts in better understanding of the overall problem and later in implementing a chosen course of action. Decision analysis can also benefit from the pre-event and post-event activities of value engineering. Often a decision analysis will not produce the fullest potential value because there is a lack of both pre- and post-planning to ensure correct implementation. In addition, a common problem experienced by decision analysis is a lack of creative alternatives. While a good facilitator can usually help a team get "out-of-the-box", decision analysts can also benefit from the creativity in exploring and developing options brought by the value engineering approach.

Value engineering can also greatly benefit from the decision analysis toolset. Of greatest benefit would be the probabilistic framework for gathering assessments of value ranges and probabilities for uncertainties that impact a decision. The reliance on single point estimates and assumed success used in value engineering undermine any belief that senior management has with the analysis results. In addition, analysis tools such as the tornado diagram, risk plot, and value of information tree can provide better insights into the value and ranking of functional or cost reducing opportunities. By using the tornado diagram value engineers can pro-

vide management with a sensitivity analysis that reveals what alternatives may provide the greatest potential value and their ranking in importance to the project or product. Used in conjunction with the tornado diagram, the risk plot provides value engineers with a risk versus reward picture of various scenarios or sets of value adding options. This view is critical when selected options can impact the risk of downside events or delays in cycle time. These two tools are the most often asked for by senior management when making critical decisions. An additional tool, the value of information tree, is also very useful in situations where the decision-maker is asking for more information before deciding on a course of action. This is a common problem for any process and this tool can actually quantify the value to be gained from gathering or purchasing additional information.

Each process can benefit from using only some or many of the tools previously mentioned. The key is understanding what the tools can bring to each process and how to apply them with each process. This brings us to the forth point of the paper which is how to make the marriage work.

#### MAKING THE MARRIAGE WORK

As with any marriage there is a need for a courting period where each partner gets use to the other and learns to adapt to the other partner's differences. The same is true for decision analysis and value engineering. Decision analysts and value engineers should learn more about each other's processes and toolsets. This cross learning of the two processes can occur through information sharing among consultants, attending industry forums and seminars, web sites, and discussion forums designed to facilitate this type of dialog. Of course, the best learning environment is for practitioners of both processes to work together on a joint project. It is through this joint approach that this author working with Jerry Kaufman (J.J. Kaufman and Assoc.) and James McCuish (BP Amoco) has seen and developed many of the linkages presented in this paper.

After a period of courtship between two parties there will come a decision whether to marry. This presents all of the complexities and uncertainties that may be present in a real marriage between two people. Probably foremost in anyone's mind is the question of permanence. Will this last over time? While the work that the author and others have done over the last few years is still developing and maturing, the issue of permanence is somewhat resolved in that both processes have

stood the test of time (each being around for more that 40 years). The cross learning of tools and techniques as outlined in this paper will only increase the robustness and staying power of each parent process.

Other ideas that may lead to making the marriage work, or work even better include:

- a) Joint conferences and seminars,
- b) Public courses on the linkages using real case studies,
- c) Development of a common and agreed upon terminology, and
- d) Creation of a joint web site or forum.

In every marriage there is always some level of fear of the unknown. This is not only common but also part of human nature. As practitioners we should recognize both our own fears and those of client organizations. Practitioners may fear losing process identity and focus, organizational recognition, or specific skill competence. Clients may fear the effectiveness of the new tools or unwilling to apply them due to old habits. By recognizing and dealing with these fears and concerns practitioners of both processes will be able to better serve clients and create more value adding opportunities.

#### THE PROGENY

Throughout this paper the author has discussed the possibility of the parents giving birth to an "offspring". Children ideally inherit the best qualities of each parent. This could result in a streamlined and robust process for handling both strategic and operational problems. By creating this new "offspring", the identity of each parent process is maintained intact, but practitioners now have something new to offer clients. This new process would enable external and internal client practitioners to develop creative and workable solutions at an operating level while communicating the results in a manner that all management could understand and use at a strategic decision making level.

As a child the process will need to learn and grow. This will be accomplished through early adopters of the process who will see the value and opportunities that it brings. During this period it is important for the early adopters to quickly communicate successes and failures so that others may learn and improve the process. These improvements will most likely come from how the process is facilitated more than from the choice of tools themselves. This occurs with any process as it becomes more refined and understood.

As the process moves into the adolescent phase, that is when mainstream practitioners are using the process, it will have become solid and consistent in its application with clients. It will also have a reasonable number of articles and journals describing the merits of the process. However, it is at this stage that the process could become a threat to its parents. The new process should become so adept at handling the majority of situations that you would not use the parent process, except in simple situations. How long it will take the new process to become an adolescent and break into the mainstream is unknown but could easily happen in a decade or less with constant refinement and use. As the process reaches maturity it will have captured the eye of both practitioners and management and will be the preferred process for adding value in the organization.

### CONCLUSION

The new process is still in its child, or some may say infancy state. This author and another partner (Gary Bush) in the firm have been using many of the value management tools for some time in decision analysis projects for clients in the airline, oil and gas, and chemicals industries. The key learnings presented in this paper come from the insights gained from these engagements.

As practitioners of these processes and good resource stewards, it is imperative that we continue to grow and develop our processes to provide the best alternatives to our clients. The best learning experience is to apply these new tools and techniques to real problems and learn from both the successes and failures. The resulting process and its value to customers will be the beneficiaries.

### REFERENCES

1. Skinner, David (1999) *Introduction to Decision Analysis*, Gainesville: Probabilistic Publishing.
2. Ibid.
3. Kaufman, J. Jerry (1998) *Value Management*, Crisp Publications.