Applying Earned Benefit Management[1]

Uncertain Benefits[2]

Understanding the effect of risk on benefits realization

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This article builds on the ideas described earlier in this series, and applies the Benefits Map to provide a comprehensive analysis of threats and opportunities associated with the realization of strategic benefits.

Introduction: Program Risk

In any non-trivial endeavour, the effects of uncertainty must be taken into account. In particular, this need for effective risk analysis applies to programs during all of the stages from the inception right through to the complete realization.

The current article will explain how the Benefits Map and the assocated algorithms can help to broaden the initial analysis of the various categories of uncertainty that affect programs and to take into account their interactions across the entire program.

Link to Previous Articles

Earlier articles in this series [Piney 2018*] explained how to apply the Earned Benefit cost and benefit evaluation algorithms to a representative case study.

The current article changes topic away from determining "certain" outcomes, to address the clouds of uncertainty that surround the results.

In order to allow this article to be understood independently of the earlier ones in the series, some reminders are provided below, plus an overview of the case study, prior to addressing the current topic of uncertainty analysis and risk management in programs.

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[1] This series is by Crispin "Kik" Piney, author of the book Earned Benefit Program Management, Aligning, Realizing and Sustaining Strategy, published by CRC Press in 2018. Merging treatment of program management, benefits realization management and earned value management, Kik's book breaks important new ground in the program/project management field. In this series of articles, Kik introduces some earned benefit management concepts in simple and practical terms.

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Reminder on Benefits Realization Maps

A Benefits Realization Map (BRM) illustrates how to make the benefits happen. The BRM for the case study is shown in Figure 1.

BRMs can be developed in two passes, as follows:

Top-Down Strategy Decomposition

Once the anticipated benefits have been defined by the strategic sponsor, you need to determine all of the steps that are required for delivering this result, as well as their interdependencies, thereby allowing you to identify the necessary component projects ("initiatives"). The links from each logical step to the next are quantified based on their relative importance for contributing to realizing the benefits (the "contribution fraction" for the link).

The Benefits Allotment Routine (BAR) uses the forecast benefit value of the strategic objectives in conjunction with the link contribution fractions to calculate the contribution to the anticipated benefits of each node in the BRM. In particular, the BAR evaluates the contribution to the anticipated benefits of each component project.

Because of the way the BRM is drawn with the strategic outcomes on the right and the component projects on the left, this top-down approach is also characterized as "right-to-left".

Similarly, the bottom-up approach is also known as "left-to-right".

Bottom-Up Component Evaluation

Once the full set of parameters that define the model is known (predicted benefits, estimated cost per initiative, and the structure of the benefits map including the links and their contribution fractions), no additional assumptions on the model are required in order to evaluate the cost of each intermediate node in the model. The "Break Even Everywhere Routine" (the BEER) provides the additional link parameters (the "allocation fractions") required for calculating the corresponding cost of each node, based on the cost of the initiatives and the structure of the map.

The BAR and the BEER

It is important to understand the way in which the model works:

The BAR – by applying the contribution fractions – can be used to evaluate the top-down effect of nodes across the BRM and diffuse values from right to left. Although the BAR algorithm was initially applied to the contributions, it can also be used to diffuse any other program-related values across the model from right to left.

Due to the way in which the BEER was specified, the allocation fractions provide the means for distributing not only costs but also other quantities (such as node Earned Benefit) across the map from the initiatives (on the left in the BRM) towards the strategic outcomes (on the right).

In general, therefore, the strategic effects diffuse from right to left, according to the BAR. Tactical activities affect downstream nodes, from left to right, based on the BEER.

These algorithms are used to evaluate the forecast contribution and allocation of each node based on the forecast benefits and implementation costs. This is known as the "static model". The addition of ramp-up durations and other lead times illustrated by use of a roadmap can be used to forecast the program's cash-flow. This is known as the "dynamic model". The current article focusses principally on the static model, although the concepts used can also be applied directly to the dynamic model.

The Case Study for the Current Article

The business objective of the program in this example is to increase profits for an organization in the area of customer service. The premise of the case study is that strategic analysis by senior management has shown that increased customer satisfaction with after-sales support enhances business results and has the potential for delivering additional revenue of €300,000 per annum compared with the current level of business. However, this service will also lead to an increase in operational costs amounting to 25% of the corresponding financial improvement, thereby reducing the net benefit by that amount.

In the previous articles, the steps to achieving the business objective were developed and quantified, all the way back from the required strategic outcome across to identifying the required projects. The corresponding BRM for this program, including the financial numbers and allocation fractions mentioned above, is shown in Figure 1 and, in tabular form as the forecast baseline in Table 1.

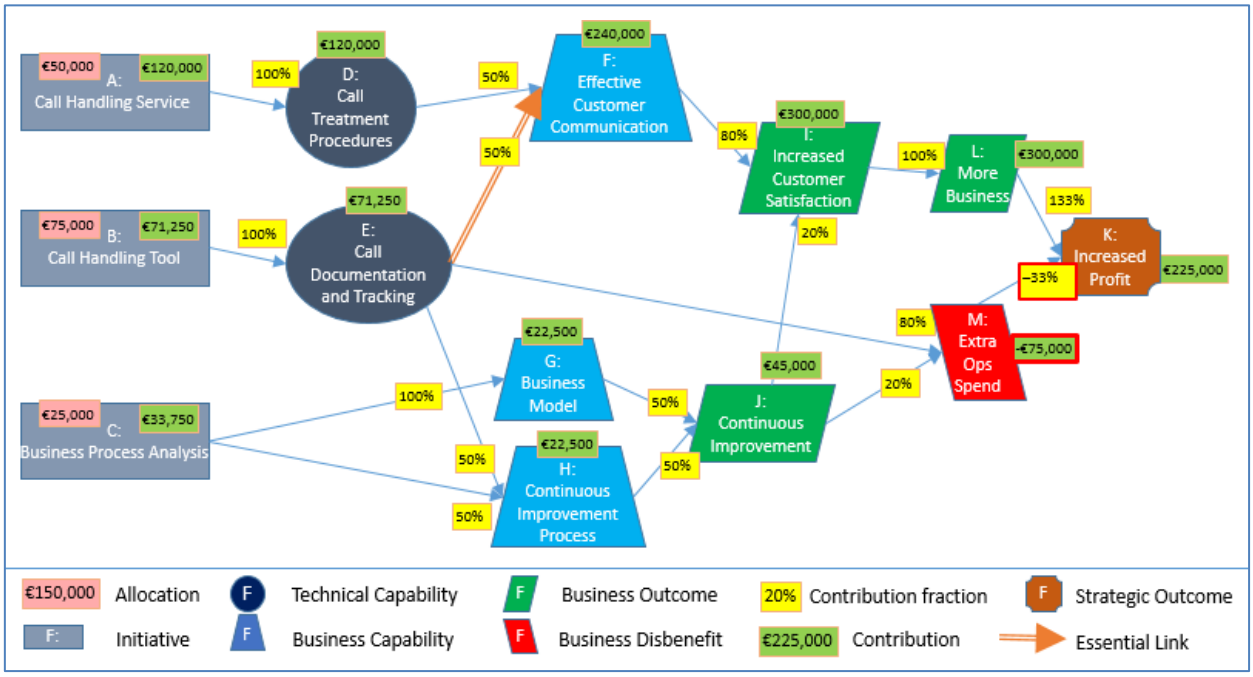

Figure 1: Complete Benefits Map

		Allocation	Contribution
A	Call Handling Service	€50,000	€120,000
B	Call Handling Tool	€75,000	€71,250
C	Business Process Analysis	€25,000	€33,750
D	Call Treatment Procedures	€50,000	€120,000
E	Call Documentation and Tracking	€75,000	€71,250
F	Effective Customer Communication	€176,316	€240,000
G	Business Model	€16,667	€22,500
H	Continuous Improvement Process	€20,175	€22,500
I	Increased Customer Satisfaction	€225,439	€300,000
J	Continuous Improvement	$36,842	$45,000
L	More Business	$225,439	$300,000
M	Extra Ops Spend	-$75,439	-$75,000
K	Increased Profit	$150,000	$225,000

Table 1: Baseline Forecast for the Case Study

After these reminders, we are now in a position to move forward and apply the Earned Benefit-related techniques to the analysis of program risks.

Some Words About Risk Analysis

What is "Risk"?

By definition, risk is "the effect of uncertainty on objectives" [ISO, 2018].

Some of the implications of this definition are analyzed in Piney (2012) and this analysis is expanded into a "Total Risk and Issue Management" process in chapter 9 of my book [Piney 2018].

The key considerations for the current article are that:

- the definition does not intend to convey the idea that risk has an effect on objectives – quite the reverse, in fact: risk analysis addresses the effect of uncertainty *with respect to* well-specified, definitive objectives: without fixed objectives, there can be no valid concept of risk;
- risk is not simply "the effect": this effect needs to be explicitly linked to the type and magnitude of the uncertainty ("the likelihood") as well as to the specific objectives that are affected;
- uncertainty goes away once the occurrence becomes impossible or when the effect materializes. Although the risk as such ceases to exist in both of these cases, in the second case, the corresponding event along with its impact is characterized as "an issue". The need to manage the effect of this issue remains – for instance, by activating a previously-defined contingency plan – and these issue-management actions carry a new set of risks. Some action may also be required in the case where the risk

disappears, to cancel any contingency plans and the associated resource implications. This link between risks and issues explains the need for total risk and issue management as a seamless process-flow involving the entire BRM;

- although simple projects can focus mainly on the analysis of individual risks, the additional complication and interdependencies that are inherent in programs require the analysis of the overall risks – that is to say, the combined effect of multiple uncertainties with respect to the program objectives.

Analyzing Overall Risk

As mentioned above, overall risk arises from the combined effect of individual risks. The goal of analyzing overall risk is to gain an understanding of the likelihood of the range of potential uncertain effects. This analysis is normally shown as a graph or a table presenting the potential values of these effects against their corresponding likelihoods as shown in Figure 2.

One commonly-used approach for generating this information is "Monte Carlo simulation". [e.g., Barreras, A. J. (2011)]. This technique allows you to address variability in a number of parameters such as time, cost, benefit contributions, etc., based on estimations and forecasts for the individual risks and their individual impact-probability profiles. Monte Carlo simulation involves generating a set of sample results by selecting risk impact values randomly based on their specified frequency profile. This set of sample results is then plotted on a graph showing the frequency of occurrence (the "Sample Count" in Figure 2), against the corresponding value. The frequency of occurrence is considered to be a valid indicator of the corresponding probability (as shown in the "Completion Probability Table" in Figure 2).

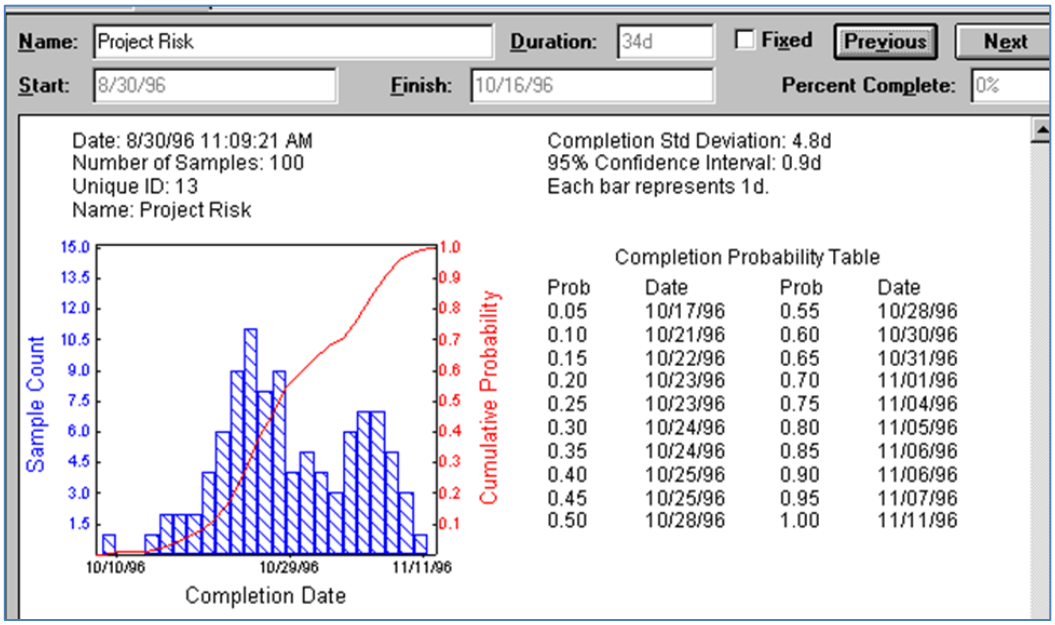

Figure 2: Typical Result of a Monte Carlo Simulation

The starting-point, therefore for any Monte Carlo analysis is to have a reliable means of evaluating each sample value.

In the program environment, the Earned Benefit framework and the corresponding BRM can provide the basis for these calculations, as explained next.

Dealing With Risk in Programs

For programs, the objectives are clearly defined in the BRM. What remains to be understood, therefore, is the role of uncertainty. Based on their origin and effects, six categories of uncertainty can be identified:

- Model uncertainty. The overall benefits realization map is only an approximation to the ideal solution and, as such, is unlikely to provide the basis for a perfect plan.
- Strategic uncertainty. This is related to potential variation in strategic objectives and underlying conditions.
- Result uncertainty. The relationship between a result and its expected effect needs to be reviewed as to its actual likelihood of occurrence: for example, providing a capability does not unfailingly lead to a desired outcome;
- Deliverable uncertainty. Programs depend on their component projects. Each project carries its own degree of uncertainty as to its potential success.
- Budget uncertainty. Forecast costs carry a degree of uncertainty.
- Schedule uncertainty. Forecast timings carry a degree of uncertainty.

Each of these categories of risk affects the BRM and its algorithms in different ways.

Addressing Model Uncertainty

As mentioned in Piney 2018b and 2018c, uncertainty around the model itself and trade-offs between various solution approaches and BRM structures can be addressed by use of scenario analysis [see also: Pollack-Johnson (2015)].

The evaluation of the overall risk from the other categories of uncertainty is closely related to the structure of the BRM that has been developed.

Strategic Uncertainty

Strategic variation can occur for a number of reasons such as management reviews and changing market conditions.

Potential changes of strategy are normally addressed by use of classical scenario analysis and that would be the case if, as for model uncertainty above, the changes lead to the need to modify the inherent structure of the BRM. However, if the strategic changes are limited to the value of the planned benefits or the contribution fractions, this category of uncertainty can be analyzed across the entire model by applying additional Earned Benefit concepts and tools that have been developed. The techniques that should be used to evaluate the effect are specific to of each of these types of variation (change to the strategic benefits; change to contribution fractions).

The effects of a direct change in the strategic benefits can be evaluated by updating the benefits nodes and then using the BAR algorithm to diffuse this change across the BRM from right to left.

A change in a contribution fraction has two separate effects: it modifies the values of the links into the destination node; it also affects the destination node directly by the addition or removal of a contribution amount. To take this type of strategic change into account, the change to the contribution needs to be diffused forward to the benefits nodes using the BAR; the model itself then needs to be re-evaluated in line with the revised contribution values and contribution fractions by applying the BEER to recalculate the complete model.

Result uncertainty has similar effects on the model.

Result Uncertainty

This uncertainty is associated with each link is the BRM. Each link corresponds to an assumption as to the potential effect of the source node on the destination node. Links carry a value (the contribution share) that indicates the value of this effect. Variations in the link characteristics have three effects on the overall model:

- the contributions of the source nodes of all changed links need to be recalculated based on the modified weightings of the outgoing links, by applying the BAR algorithm to these source nodes;
- due to the change in the contribution of these source nodes, the BAR algorithm will also lead to changes in the contributions of all upstream nodes;
- due to these changes to the contributions, the BEER algorithm leads to changes in the allocations of all downstream nodes.

Overall, therefore, although the overall ROI of the program is unaffected by the uncertainty as to the sharing of contributions, the ROI of each node can be expected to change due either to the variation in its contribution or to its allocation.

These effects are shown in the worked example later in this article.

Deliverable Uncertainty

Technical uncertainty relates to the ability of the technical team to satisfy the requirements placed upon their deliverables. This effect relates specifically to satisfying the specified scope of the deliverable. The impact will be modelled as an increase or decrease in the contribution of the corresponding node in the BRM.

Technical effects diffuse across the BRM from left to right. The BEER should therefore be used to evaluate the resulting effect of each risk identified in this category.

Budget Uncertainty

The budget uncertainty affects the initial business plan as well as cash-flow calculations for benefits realization.

Schedule Uncertainty

The schedule uncertainty affects the cash-flow calculations for benefits realization.

Overall Program Risk

Both model uncertainty and strategic uncertainty are linked to potential changes in the solution approach; they affect the content and structure of the benefits map. However, the causes of each of these categories are unrelated. For this reason, although they can both be analyzed using Monte Carlo simulation, each of these categories is best analyzed in separate simulation runs.

All of the other risk categories listed above refer to risks that apply to a given solution approach – and therefore a specific BRM. These categories will be called "solution-specific" risk categories. Although the Monte Carlo approach can be used to model the overall risk in each category separately, the BRM can also be used to evaluate the combined effect of these solution-specific risks. In this way, simulation can be used to provide a model of the "full overall risk".

As explained earlier, each of Strategic, Result and Deliverable (SRD) uncertainty in a given node or link will affect a number of the other nodes in the BRM. For this reason, the resultant effects need to be combined in an integrated set of calculations (the "Program Overall Risk Tolerance Evaluation Routine" (PORTER)). The output of each such calculation can then be used as one sample value in a Monte Carlo analysis of the joint effects of SRD uncertainty. The result of this calculation for each chosen value of the SRD uncertainty effects provides a model of the variation around the (deterministic) baseline values of the model. The magnitude of this variation should be compared with the organization's stated risk tolerance limits.

The results of a specific sample calculation for the overall risk of each of the solution-specific risk categories for strategy, result and deliverable uncertainty, based on the case study, are provided below. The PORTER is then be applied to the case study in order to provide a example of the combined effects of these separate categories of uncertainty on the overall program risk to benefits cost objectives.

Numerical Examples

Strategic Uncertainty

In this example, management considers that the estimate for the *Extra Operational Spend* disbenefit (node M) could vary between 10% and 30%. Similarly, the value of *More Business* (node L) can vary between €250,000 and €350,000. However, to avoid making the example too complicated, only the disbenefit due to node M will be changed. The current sample calculation is therefore based on an -15% impact from M (as opposed to the baseline of -25%); the value of L remains at €300,000.

In this case, therefore, the strategic variation leads to a change (increase) in the contribution share of M due to reducing the disbenefit by 15% of €300,000 – i.e., an increase in the

contribution of K of (10% * €300,000 =) €30,000. This amount will be diffused left-to-right from node M. In the current case, this adds €30,000 to the baseline value of node *K=Increased Profit*. The additional change – i.e., the change in the contribution fraction relative to node M – is then made and the model re-evaluated to diffuse these changes due to strategic uncertainty right-to-left using the BAR.

The result is shown in Table 2:

- The size of the disbenefit from node *M=Extra Operational Spend* has fallen, as expected, due to the improved (negative) contribution share;
- in contrast with the baseline value, the *Call Handling Tool* (node B) now shows a positive return
- this positive return is, however, at the expense of the disbenefit of *Extra Operations Spend* (node M) for which there is a shortfall of almost €9,000 in the allocation provided by the model.

These calculations provide additional information on the overall variation. The current example shows that fairly small variations in strategic forecasts can have important impacts on the detailed analysis of the business plan. The Monte Carlo analysis can also evaluate, for example, for each of the initiatives, the likelihood that it will cost more than it delivers.

		BASELINE		RESULT OF STRATEGIC VARIATION		STRATEGIC CONTRIBUTION VARIANCE	
		Allocation	Contribution	Allocation	Contribution		
A	Call Handling Service	€50,000	€120,000	€50,000	€115,304	-€4,696	-4%
B	Call Handling Tool	€75,000	€71,250	€75,000	€101,446	€30,196	42%
C	Business Process Analysis	€25,000	€33,750	€25,000	€38,250	€4,500	13%
D	Call Treatment Procedures	€50,000	€120,000	€50,000	€115,304	-€4,696	-4%
E	Call Documentation and Tracking	€75,000	€71,250	€75,000	€101,446	€30,196	42%
F	Effective Customer Communication	€176,316	€240,000	€135,246	€230,609	-€9,391	-4%
G	Business Model	€16,667	€22,500	€16,667	€25,500	€3,000	13%
H	Continuous Improvement Process	€20,175	€22,500	€17,760	€25,500	€3,000	13%
I	Increased Customer Satisfaction	€225,439	€300,000	€174,163	€288,261	-€11,739	-4%
J	Continuous Improvement	$36,842	$45,000	€34,426	$51,000	€6,000	13%
L	More Business	$225,439	$300,000	€174,163	$288,261	-€11,739	-4%
M	Extra Ops Spend	-$75,439	-$75,000	-€24,163	-$33,261	€41,739	-56%
K	Increased Profit	$150,000	$225,000	$150,000	$255,000	€30,000	13%

Table 2: The Effects of the Strategic Variation

Result Uncertainty

As explained above, result uncertainty comes from the assumptions associated with links in the BRM. Also, because of the interdependence between the effects within in program, variation on one link can affect all of the downstream nodes.

In the following example, the contribution of *E=Call Documentation and Tracking* to *F= Effective Customer Communication* could vary between 30% and 65%. The sample calculation below (Table 3) shows the effect when this value is changed from the baseline of 50% to a value of 60%. Correspondingly, the other contribution share (from *D=Call Treatment Procedures*) is adjusted to 40%.

These changes affect only the contributions and allocations of the intermediate nodes, as the overall strategic and individual project assumptions are unchanged.

As explained earlier, and highlighted in Table 3, the contribution change due to this Result variation affects the contributions of all nodes upstream (to the left) of the destination node; simultaneously, the allocations of all of the downstream nodes are affected.

		BASELINE			EFFECT OF RESULT VARIATION			RESULT ROI VARIANCE
		Allocation	Contribution	ROI	Allocation	Contribution	ROI	
A	Call Handling Service	€50,000	€120,000	140%	€50,000	**€96,000**	92%	-48%
B	Call Handling Tool	€75,000	€71,250	-5%	€75,000	**€102,000**	36%	41%
C	Business Process Analysis	€25,000	€33,750	35%	€25,000	**€27,000**	8%	-27%
D	Call Treatment Procedures	€50,000	€120,000	140%	€50,000	**€96,000**	92%	-48%
E	**Call Documentation and Tracking**	**€75,000**	**€71,250**	**-5%**	€75,000	**€102,000**	**36%**	**41%**
F	Effective Customer Communication	€176,316	€240,000	36%	**€155,882**	€240,000	54%	18%
G	Business Model	€16,667	€22,500	35%	**€20,833**	€22,500	8%	-27%
H	Continuous Improvement Process	€20,175	€22,500	12%	**€17,402**	€22,500	29%	18%
I	Increased Customer Satisfaction	€225,439	€300,000	33%	**€206,863**	€300,000	45%	12%
J	Continuous Improvement	$36,842	$45,000	22%	**€38,235**	$45,000	18%	-4%
L	More Business	$225,439	$300,000	33%	**€206,863**	$300,000	45%	12%
M	Extra Ops Spend	-$75,439	-$75,000	-1%	**-€56,863**	-$75,000	32%	32%
K	Increased Profit	$150,000	$225,000	50%	$150,000	$225,000	50%	0%

Table 3: The Effects of Result Variation

Because of the structure of the BRM in this example, variation in the result of providing the *Call Documentation and Tracking* (node E) logically adds value to the contribution of the *Call Handling Tool* (node B). In addition, in the same way as for the Strategic Variation example in Table 2, these calculations show that, whereas in the baseline model, *B=Call Handling Tool* cost more than it delivered, in this sample calculation, the reverse is true.

Deliverable Uncertainty

This variation is based on the fact that the expectations on the initiatives are, as for any project endeavour, not certain to be achieved exactly as specified. The variation for this category of uncertainty is a result of missed (or valuably enhanced) scope and affects the potential contribution of the initiative.

The calculation in this case takes into account a percentage change in the contribution of the corresponding initiative and its effect on all of the relevant downstream nodes.

In the following example, the contribution of *B=Call Handling Tool* is assumed to vary between -15% and +5% around the initially forecast value. The calculation of the sample is based on a shortfall of 10%.

The effect on the program is calculated by evaluating the corresponding impact of this shortfall on all of the nodes in the BRM, by applying the BEER algorithm to this shortfall. The value of the change to each node is then added to the baseline value, as shown in Table 4.

		BASELINE		DELIVERABLE VARIATION	EFFECT OF DELIVERABLE VARIATION	DELIVERABLE VARIANCE
		Allocation	Contribution	Contribution	Contribution	Contribution
A	Call Handling Service	€50,000	€120,000	€0	€120,000	0%
B	Call Handling Tool	€75,000	€71,250	**-€7,125**	€64,125	-10%
C	Business Process Analysis	€25,000	€33,750	€0	€33,750	0%
D	Call Treatment Procedures	€50,000	€120,000	€0	€120,000	0%
E	Call Documentation and Tracking	€75,000	€71,250	-€7,125	€64,125	-10%
F	Effective Customer Communication	€176,316	€240,000	-€12,000	€228,000	-5%
G	Business Model	€16,667	€22,500	€0	€22,500	0%
H	Continuous Improvement Process	€20,175	€22,500	-€1,125	€21,375	-5%
I	Increased Customer Satisfaction	€225,439	€300,000	-€13,500	€286,500	-5%
J	Continuous Improvement	$36,842	$45,000	-$1,125	$43,875	-3%
L	More Business	$225,439	$300,000	-$13,500	$286,500	-5%
M	Extra Ops Spend	-$75,439	-$75,000	$6,375	-$68,625	-9%
K	Increased Profit	$150,000	$225,000	-$7,125	$217,875	-3%

Table 4: The Effects of Deliverable Variation

As can be seen from Table 4, although the shortfall due to the variation in scope of *B=Call Handling Tool* is only €7,125, this results in a larger reduction *in I=Increased Customer Satisfaction* due to the effect on *F=Effective Customer Communication*, because of the dependency of customer satisfaction on the correct and timely information to be provided by the tool.

Combined Effect of Strategic, Results and Deliverable Uncertainty

All three effects that were just analyzed separately can combined into a single sample calculation. The combined effect of the reduction in the *Extra Operational Spend* disbenefit to 15%, *Call Documentation and Tracking* providing increasingly effective customer communication (increase of the contribution fraction from 50% to 60%), plus the effect of losing 10% of the capabilities in the *Call Handling Tool* is shown in Table 5.

		BASELINE			EFFECT OF FULL OVERALL VARIATION			FULL OVERALL VARIANCE %	
		Allocation	Contribution	ROI	Allocation	Contribution	ROI	Contribution	ROI
A	Call Handling Service	€50,000	€120,000	140%	€50,000	€92,243	84%	-23%	-56%
B	Call Handling Tool	€75,000	€71,250	-5%	€75,000	€112,056	49%	57%	54%
C	Business Process Analysis	€25,000	€33,750	35%	€25,000	€38,250	53%	13%	18%
D	Call Treatment Procedures	€50,000	€120,000	140%	€50,000	€92,243	84%	-23%	-56%
E	Call Documentation and Tracking	€75,000	€71,250	-5%	€75,000	€112,056	49%	57%	54%
F	Effective Customer Communication	€176,316	€240,000	36%	€133,348	€216,772	63%	-10%	26%
G	Business Model	€16,667	€22,500	35%	€16,667	€25,500	53%	13%	18%
H	Continuous Improvement Process	€20,175	€22,500	12%	€16,014	€24,225	51%	8%	40%
I	Increased Customer Satisfaction	€225,439	€300,000	33%	€170,291	€272,983	60%	-9%	27%
J	Continuous Improvement	$36,842	$45,000	22%	$32,680	$49,725	52%	11%	30%
L	More Business	$225,439	$300,000	33%	$170,291	$272,983	60%	-9%	27%
M	Extra Ops Spend	-$75,439	-$75,000	-1%	-$20,291	-$30,434	-50%	-59%	-49%
K	Increased Profit	$150,000	$225,000	50%	$150,000	$242,549	62%	8%	12%

Table 5: The Combined Effects of the SRD Variations: the Result the PORTER

The PORTER shows that the combined effects lead to considerable changes in the values of the allocations and contributions of the initiatives as well as for the intermediate nodes, whereas the overall change to the bottom line as calculated for the benefit node *K=Increased Profit* is commensurate with the degree of variation of each of the three categories of uncertainty in this sample calculation.

It can be tempting to try to draw general lessons from this single sample, but each of these would then need to be verified by designing additional test cases. Typical questions to investigate include:

- How to explain the reduction in the disbenefit corresponding to *M=Extra Operational Spend* of almost 60%? Why is the effect of reduced effectiveness of the *Call Handling Tool* (node B, "deliverable-related" variation =-10%) so much less important to the result than the complementary reduction in the disbenefit of the *Extra Operational Spend* (node M, "strategy-related" change) from -25% to -10%?

- Given the large range of variation in ROI despite the smaller variation in the model parameters on which the ROI is based, is ROI a valid indicator to use in justifying and tracking the viability of the components of the corresponding BRM?

Concluding Remarks

We have discussed the potential effects of six categories of uncertainties on the overall results of a program. The effects can be evaluated separately per category, or evaluated for cases where uncertainties in several categories at once affect the parameters of the program model.

These calculations can be carried out repeatedly for multiple parameter values chosen according to the characteristics of the corresponding uncertainty curves. The sample calculation values can then be plotted by frequency of occurrence to provide a forecast of the likelihood of the possible range of effects of the uncertainties.

Each sample calculation on its own can give insights into the sensitivity of the model to the various categories of uncertainty. The calculations carried out on the case study appeared to indicate that the effect of strategic uncertainty was the main contributor to the full overall variation in the program. Insights of this type can be extremely valuable in planning the approach for managing the risks in a given program, by allowing the team's efforts to be focussed on the highest-priority risks.

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About the Author

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After many years managing international IT projects within large corporations, **Crispin ("Kik") Piney**, B.Sc., PgMP is now a freelance project management consultant based in the South of France. At present, his main areas of focus are benefits realization management, risk management, integrated Portfolio, Program and Project management, as well as time and cost control. He has developed advanced training courses on these topics, which he delivers in English and in French to international audiences from various industries.

Kik has carried out work for PMI on the first Edition of the Organizational Project Management Maturity Model (*OPM3™)* as well as participating actively in fourth edition of the *Guide to the Project Management Body of Knowledge* and was also vice-chairman of the Translation Verification Committee for the Third Edition. He was a significant contributor to the second edition of both PMI's Standard for Program Management as well as the Standard for Portfolio Management. In 2008, he was the first person in France to receive PMI's PgMP® credential; he was also the first recipient in France of the PfMP® credential. He has acted as subject matter expert on many of PMI's recent standards and practice guides. He is co-author of PMI's *Practice Standard for Risk Management*. He collaborates with David Hillson (the "Risk Doctor") by translating his monthly risk briefings into French. He has presented at a number of recent PMI conferences and published formal papers.

Kik Piney is the author of the book *Earned Benefit Program Management, Aligning, Realizing and Sustaining Strategy*, published by CRC Press in 2018

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