Agile Uncertainty Assessment

for Benefit Points and Story Points

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Estimates are inherently uncertain, and it's fair to expect that business value estimates are even more so. By making this uncertainty explicit, you can manage and monitor your agile project according to upper and lower margins of uncertainty. The trick is to instantiate benefit points and story points with values reflecting various scenarios.

AGILE IS A FRAMEWORK designed for handling uncertainty, Agile is also all about project learning, but for this, you must systematize your stakeholders' assessments of the situation as well as monitor and analyze any metrics you might have. To utilize the agile framework to a full extent, this article will help your initiative to be explicit about uncertainty on both business value and cost.

To deliver high value relative to cost early, you must assess business value of your deliverables in addition to their cost. To do this, we previously suggested that you assign benefit points (BPs) in addition to story points (SPs) to your initiative's product elements (epics, minimal viable products, backlog items, etc.)[1]. This allows you to organize product element backlogs to the end of maximizing high business value to cost as early as possible

Having assigned BPs and SPs to product elements, you can trace what's going on in your initiative. You can keep track of how much potential business value your initiative is producing, in addition to how much life-cycle cost is being incurred (as in Earned Business Value Management)[2].

Here, we'll show how to instantiate BPs and SPs with various values according to bad, neutral and good case forecasts. Then, you can track your initiative's construction in terms of different scenarios. The forecasts are the results of uncertainty assessments in your initiative.

After reading this, you might be inspired to systematize your project stakeholders' perceptions on uncertainty for both business value and cost. Then, you'll be able to plug those perceptions into your points-based metrics, so that you can extrapolate current progress on benefit and cost in plans that also have uncertainty margins. During construction, you can subsequently monitor progress according to those plans. You can use Agile's practices to aim at high value output early amidst all the uncertainty.

Linking in the Business Case

Estimating business value requires that you have a systematic way of assessing your initiative's contribution to objectives and returns. Figure 1 sketches a portfolio of three initiatives. Each initiative has its designated objectives which express the initiative's intended effects on business processes; for example "time for processing incoming requests reduced by 60 percent". Each initiative has requirements in the form of product elements expressing integral functional parts that give value for business. An example in the form of a Scrum-style epic could be "As a user, I can autofill my application form with pertinent personal data".

We presented the core practice of assigning benefit points to product elements in an earlier IEEE Software article[1]. We recapitulate this here, with more details in the "Assigning Benefit Points Frame".

You assign benefit points to the initiatives' product elements according to their relative expected contribution to the initiative's objectives. This is the *Benefit* relationship in Figure 1. Figure 2(a) shows an example with eight product elements (epics in this case) *E1—E8* and their relative contribution to each of three objectives *Obj1—Obj3*.

In the example in Figure 2, you'll notice we've used Fibonacci numbers for benefit assessment, thus adapting planning poker to a game of benefit poker.

Further, project objectives are expected to contribute to returns in the business' strategic plan, but may do so unevenly. So to reflect that objectives represent different business value, objectives are assessed for their contribution to strategic returns. This is the *Worth* relationship in Figure 1.

Figure 2(b) exemplifies with returns (*Ret1–Ret3*) filled out for the objectives of Initiative *B*. Here, proportions of the objectives' worth on returns are estimated in a portfolio perspective. For example, Initiative *B*'s *Obj1* is assessed to contribute 10 percent of the portfolio's total return on *Ret1*. And *Ret1* is set at half the total planned return of the portfolio (concretized with 100 million of your favorite currency). In the "Sum" column, the resulting total estimated worth of each objective is given, and in the "Weights" columns, the objectives' corresponding relative weights are given; both with respect to the initiative and to the portfolio.
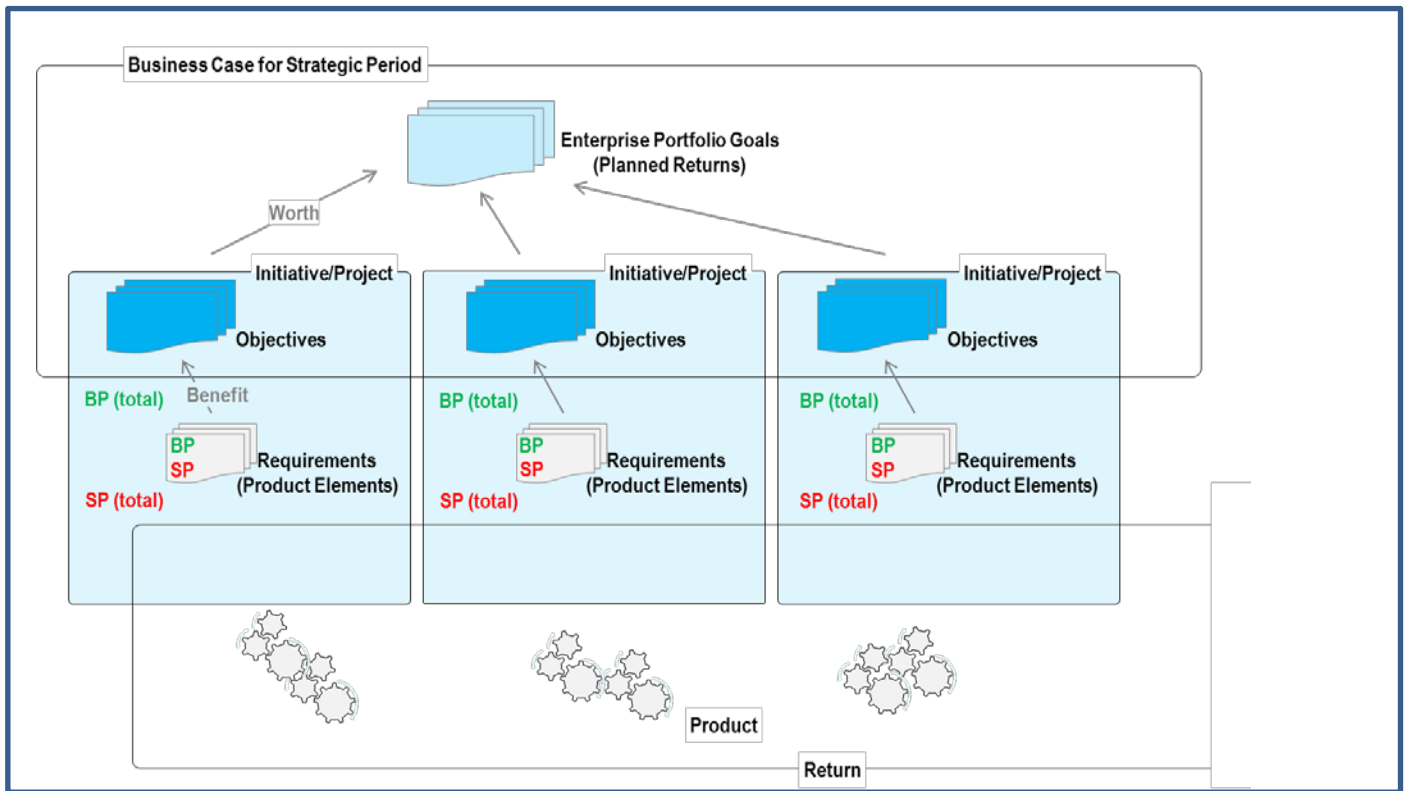
FIGURE 1. A portfolio of three initiatives or projects within a strategic period. The strategic period has portfolio goals at the enterprise level. The initiatives have objectives that together contribute fully (in terms of their *worth*) to those goals. Each initiative has requirements formed as product elements which are functionally meaningful and deployable units of functionality (in the *Minimum Viable Product* sense). The product elements of an initiative contribute fully (in terms of their *benefit*) to the initiative's objectives. Product elements are assigned both story points---or size points (SP) and benefit points (BP). The resulting benefit/cost index BP/SP allows you to prioritize product elements. The total points (SP total and BP total) for each initiative allows you to prioritize initiatives at the portfolio level in the same manner.

To ease cognitive load, we make a point of working on the *Benefit* and *Worth* relationships separately[1]. Then, you combine the two relationships to get business value: *Benefit* x *Worth* = *Business Value*. Figure 2(c) shows the BPs adjusted to reflect the combined relationship; see the "Assigning Benefit Points Frame" if you're interested in more details.

Assigning story points for life-cycle cost is another core practice that you probably are somewhat familiar with already—for this example assumes the story points in Figure 2(d). Now, we get a points-based benefit/cost- ratio size by dividing benefit points by story points as shown in Figure 2(e). This benefit/cost-ratio size can subsequently be used to order your backlog for producing high business value to cost early and to monitor and manage production with respect to realized potential business value and incurred cost. This was discussed earlier in a second IEEE Software article[2].

Don't be overwhelmed by all the numbers; it's only the white portions of the tables in Figure 2, your stakeholders must provide for. The rest should be subsequently computed by your tool. For related estimation techniques se the "Other Agile Estimation Techniques frame."

Instantiate Points with Money

Points-based estimates are purely relative estimates; the rationale being that it's easier to perform comparative judgments than absolute judgments.

OTHER AGILE ESTIMATION TECHNIQUES

Agile-at-scale frameworks such as Large Scale Scrum (LeSS) and the Scaled Agile Framework (SAFe) present alternative models for prioritizing product elements. And our approach expands on the idea of Relative Value Points (RVPs) from LeSS in a systematic way. The Weighted Shortest Job Firs (WSJF) of SAFe, however, is too complicated for our methodology, which must facilitate formal estimation in a simple as possible, and good enough, manner for prioritization, reporting and learning. The movement #NoEstimates, while attracting a lot of agile practitioners lately, falls short in the context of the benefit over cost optimization that is so crucially needed in large agile projects. For this, we need to assess both benefit and cost in quantified terms on ratio scales. Only then can you assess the benefit/cost ratio on product elements in a consistent manner.

TABLE 1.
Points instantiated by 1BP=0.36 million, 1SP=0.6 million.

	Benefit	Cost	Benefit/Cost
E3	8.45	1.80	4.69
E7	10.24	3.00	3.41
E2	16.36	4.80	3.41
E4	6.28	3.00	2.09
E8	9.67	4.80	2.01
E1	8.99	4.80	1.87
E5	10.91	7.80	1.40
E6	5.60	7.80	0.72
total	76.50	37.80	2.02

(b) Relative worth of objectives on planned returns for enterprise portfolio

| | Ret1 | Ret2 | Ret3 | Total | Weight | |
| | | | | | Project | Enterprise |
millions:	100	40	60			
Initiative A						
Obj1	...	...	...	...	...	...
...	...	...	...	...	...	...
ObjN$_A$	...	...	...	...	...	...
Total A	0.10	0.55	0.40	56.00	1.00	0.28
Initiative B						
Obj1	0.10	0.10	0.125	21.50	0.28	0.11
Obj2	0.10	0.15	0.15	25.00	0.33	0.13
Obj3	0.20	0.10	0.10	30.00	0.39	0.15
Total B	0.40	0.35	0.375	76.50	1.00	0.38
Initiative C						
Obj1	...	...	...	...	...	...
...	...	...	...	...	...	...
ObjN$_C$	...	...	...	...	...	...
Total C	0.50	0.10	0.225	67.50	1	0.34
Total Portfolio	1	1	1	200.00		1

(a) Relative benefit (BPs) of epics on project objectives

	Obj1	Obj2	Obj3	Total
E1	13	5	8	26
E2	21	21	5	47
E3	21	2	5	28
E4	8	8	2	18
E5	1	3	21	25
E6	5	5	5	15
E7	13	8	8	29
E8	2	8	13	23
Total	84	60	67	211

(c) BPs adjusted for weights and total fulfilment

	Obj1	Obj2	Obj3	Total
Weights:	0.28	0.33	0.39	
E1	9.18	5.75	9.88	24.80
E2	14.83	24.13	6.18	45.13
E3	14.83	2.30	6.18	23.30
E4	5.65	9.19	2.47	17.31
E5	0.71	3.45	25.94	30.09
E6	3.53	5.75	6.18	15.45
E7	9.18	9.19	9.88	28.25
E8	1.41	9.19	16.06	26.66
Total	59.30	68.95	82.75	211

(d) Story (Size) Points (SP)

	SP
E1	8
E2	8
E3	3
E4	5
E5	13
E6	13
E7	5
E8	8
Total	63

(e) BP/SP

	BP	SP	BP/SP
E1	24.80	8	3.10
E2	45.13	8	5.64
E3	23.30	3	7.77
E4	17.31	5	3.46
E5	30.09	13	2.31
E6	15.45	13	1.19
E7	28.25	5	5.65
E8	26.66	8	3.33
Total	211	63	3.35

Assigning Benefit Points

When you assign benefit points for the Benefit relation in Figure 1, exemplified in Figure 2 (a), you should, as a rule, assess all epics relatively on one objective before moving to the next. This is because objectives may have different metrics (time, money, quality, etc.), and it requires special attention if you're going to perform relative assessment across metrics.

Here, we're assuming that the epics of an initiative are planned to fulfill the initiative's objectives completely. Since you're assessing on one objective at a time, it may happen that the BP totals for the objectives differ. Since this does not mean that some objectives are more fulfilled than others, you normalize the BPs so that the objective totals are equal: Divide by the total BPs for the objective and multiply by the total BPs for the initiative; for example for epic E1: 13/84*211. If you use "parts of the whole" assessment instead (percentages, 100-dollar test, etc.), you---or rather your tool—need not normalize.

To reflect that objectives have different worth as in Figure 2 (b), BPs can be adjusted as in Figure 2 (c). The way this is expressed on the product elements is by multiplying the BPs according to the weight of the relevant objective. For example, for Epic E1, including the normalization earlier: 0.28*(13/84*211) = 9.18 for Obj1, 0.33*(5/60*211) = 5.75 for Obj2, 0.39*(8/67*211) = 9.88 for Obj3. The numbers are presented in two-decimal precision.

FIGURE 2. Assigning BPs and SPs for epics. (a) The epics' contribution to objectives. (b) The objectives' contribution to returns. The returns are given monetary value (in millions of your favorite currency). For each objective, we obtained the "total" column to the right of the "return" columns by multiplying those goals by that objective's expected contributions and summing the results. For example, for Initiative B's *Obj1*, (100 × 0.10) + (40 × 0.10) + (60 × 0.125) = 21.50. (c) The resulting adjusted BPs. (d) The SPs for lifecycle cost. (e) The BP/SP ratio. Green indicates benefit; red indicates cost. Your project stakeholders must produce the estimates in the white background, while those in the shaded background should be automatically generated by your tool. The numbers are presented in two-decimal precision.

These relative estimates can then be instantiated with monetary values. Table 1 shows Figure 2(e) sorted, and with BPs instantiated at 1BP=0.36 million and 1SP=0.6 million. For our example, these monetary values might be the initial estimates for the business case, prior to uncertainty elaborations and also prior to project learning.

A great thing about points-based estimates is that you can instantiate them with alternative values that reflect your initiative's current understanding or different scenarios. We'll use this to reflect various scenarios according to uncertainty assessment.

Here, we'll demonstrate how to instantiate points with so-called p*X* values. The "p" stands for "percentile": If you're looking at a set of project outcome values, a p*X* value is the boundary value for which *X* percent of all outcome values fall below. So, if you have a database of historical data with actual cost outcomes, the p85 value is the value for which as many as 85 percent of the projects fall on or below on cost. Now, in the event that your database also has historical data on business value, the p15 value, say, would be the value for which only 15 percent of the projects fall on or below, or more interestingly, as many as 85
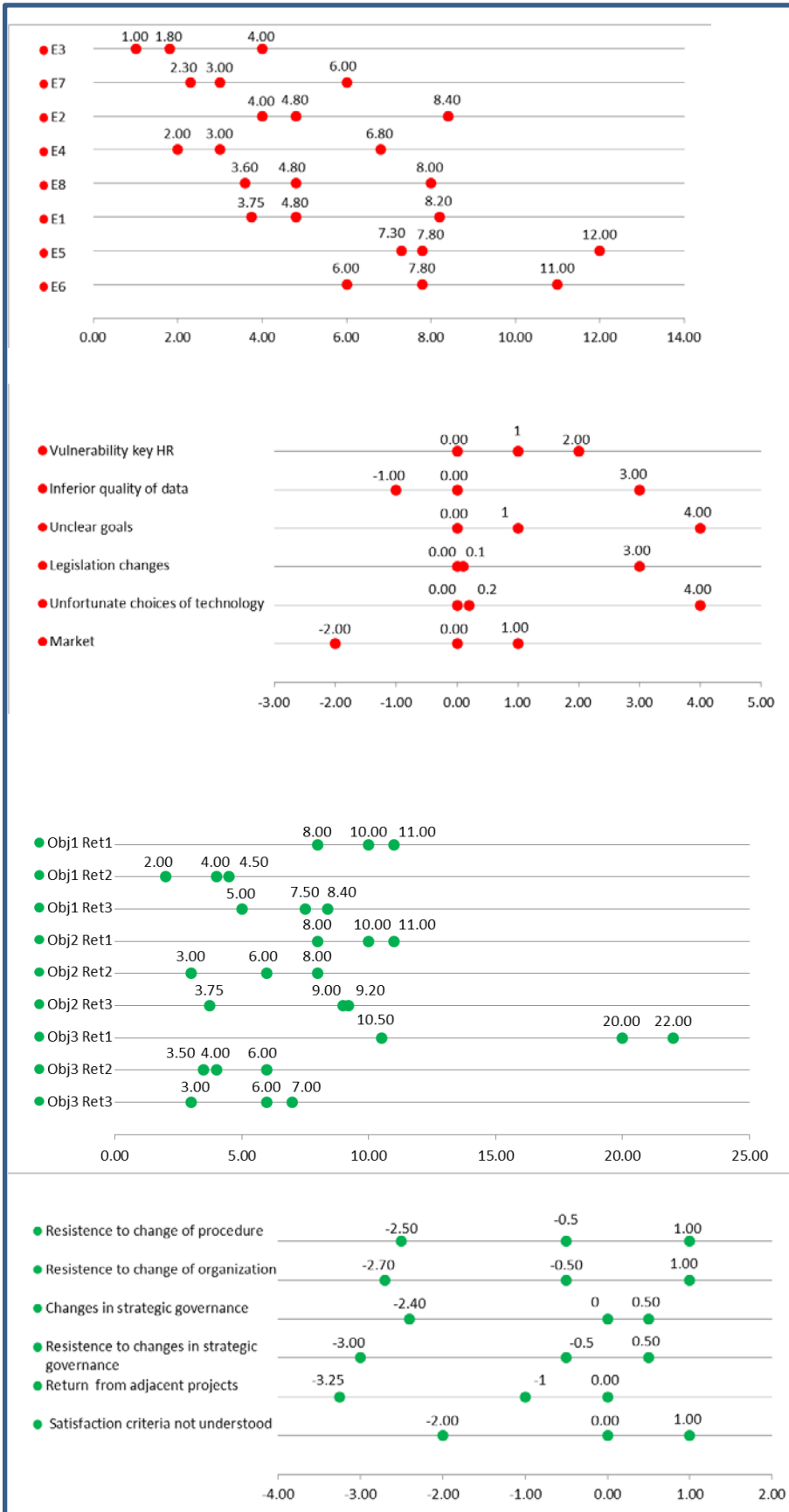
FIGURE 3. Three-point estimates for cost in red and for business value in green. Estimation uncertainty and event uncertainty, respectively.

Uncertainty Assessment

In an earlier IEEE Software article[3], Jørgensen describes how you can use historical project outcome data, or your expert perception of historical outcomes, in a holistic manner to derive pX values for initiatives as a whole. You can then plug the appropriate pX values into your project metrics via your BPs and SPs as just mentioned.

However, historical data, both explicit and tacit, is often not present or readily accessible. In particular, outcome data for business value is currently extremely sparse. In this situation, you can attempt a less holistic approach and focus on uncertainty drivers in your particular initiative or portfolio that stakeholders identify as salient.

One can sort drivers of uncertainty into two aspects: *Estimation uncertainty* and *event uncertainty*. The former reflects the fact that estimation is to forecast future events and outcomes and are therefore inherently uncertain. In our context, we have estimates of:

- a product element's effect on lifecycle cost
- a product element's effect on benefit
- an objective's effect on worth.

To assess estimation uncertainty is to contemplate the inherent uncertainty associated with these estimates.

Event uncertainty on the other hand, pertains to uncertainty arising from events in and around the initiative. Contemplating event uncertainty involves performing risk assessments.

Here, we're out to express, in a simple manner, your stakeholders' perception of uncertainty, regardless of how they arrived at that perception. We'll exemplify with three-point estimates.

Let's look at cost estimates first, since that may be most familiar. Here we choose to express estimation uncertainty on the level of epics. However, your stakeholders might find it more meaningful to assess uncertainty on groups of epics, or on other parts of the current backlog. You could also assess uncertainty at lower levels of the product breakdown structure if this is meaningful in your context.

We'll assume that the appropriate stakeholders have come up with the relative cost estimates in Fig. 2(d), and that they have used their

percent are above, on business value. The p15/p85 combination for business value and cost, respectively, represents a pessimistic bad case scenario. A god case scenario would be represented by, say, a p65/p35 combination, and a neutral case would be represented by the p50/p50 combination.

knowledge and experience to fix the initial monetary value of a story point to 0.6 million giving their estimate of most likely project development and post-deployment cost at 37.8 million as given in Table 1's *Cost* column.

The stakeholders have devised three-point uncertainty cost estimates for the epics and events given in the upper half of Figure 3. Note that the most likely cost estimates for epics are from Table 1. Note also that the three-point estimates are on monetary values, not on SPs; the rationale being that assessing uncertainty on actual values is conceptually easier than on abstract points. However, techniques for setting the upper and lower bounds in a three-point estimate in terms of percentages of a mid-value estimate[3] lend themselves to points (SPs and BPs) and actual values alike, so three-point estimates in terms of SPs and BPs are also feasible.

For example, for Epic *E3*, the most likely estimate is 1.8 million (corresponding to Table 1). It also shows a bad case estimate of 4 and a good case estimate of 1. Further, the three-point estimate for *E2* is wider than the one for *E3*, expressing lower confidence in the most likely estimate. All the three-point estimates are asymmetrical, reflecting the insight that the range of probable outcomes stretches further upward than downward.

Next, for the three-point estimates of event uncertainty in Figure 3, the value 0 signifies that the event, if it occurs, will have no impact, while negative values signify that the event may give a decrease in cost, and positive values signify that the event may give an increase in cost. Most of the event uncertainties are assessed to increase cost, but *Market* and *Inferior quality of data"* are assessed to give probabilities of decreasing cost.

Now, for uncertainty regarding business value: In the example, we choose to show uncertainty assessment on *worth*; in other words, the objectives' contribution to return from Figure 2(b). Figure 3 (bottom half) illustrates this. For example, for the *Obj3-Ret1* relationship, the perceived most likely estimate is 20 million (0.2 * 100 million in Table 2(b)), with an upper bound of 22 and a lower bound of 10. Figure 3 also shows examples of event uncertainty assessments for business value.

In contrast to those for cost, the three-point estimates reflect an expectation that the ranges of probable outcomes of business value tend to stretch further downward than upward.

You can assess uncertainty on the *benefit* relation instead, or in addition. Again, you could do this at the level of epics, groups of epics, or at lower levels, according to what

makes sense in your initiative. Here, we're assuming that stakeholders' perceptions of uncertainty are more salient at a level closer to the business domain.

Using uncertainty assessments

A three-point estimate gives a range of probable values, which is an important step in acknowledging that hitting the target on a single point estimate shouldn't be a realistic goal. By itself, though, a three-point estimate doesn't indicate how probable different values are. For that, you need a probability distribution. If you have usable theoretical or empirical results, you might be able to apply these to choose an appropriate distribution type. For example, theoretically, time and cost are in many cases distributed lognormally as illustrated in Figure 4.

Often, you aren't in a position to apply theoretical results, and you're best bet is to use lay-man methods that are good enough. The Project Evaluation and Review Techniques (PERT)[4] includes one such method, where you calculate an expected value estimate EV from a three-point estimate as EV=(low+4*most likely+high)/6. This assumes a *beta* distribution; see Figure 4 (middle).

Even simpler, a triangular distribution is given by the formula for the area of a triangle; see Figure 4 (bottom), which might be a better approximation when you're not able to apply theory or empirical data.

The low and high values in three-point estimates can have various interpretations. It matters how you ask stakeholders for these values. For example, when it falls natural for experts to think in terms of "*in one of 10 attempts on similar epics as this one, the cost will be less than X, and in nine of 10 attempts the cost will be less than Y*", it is the p10 (low) and the P90 (high) values for the epic you are estimating. The PERT method, on the other hand, prompts you on low and high values without asking for probabilities, which may be advantageous since thinking in terms of probabilities is hard[56]. The triangular distribution goes ahead and interprets your low and high values simply as p0 and p100 values.

Exactly what marginal probabilities your low and high values represent is not that important. It's more important that the interval
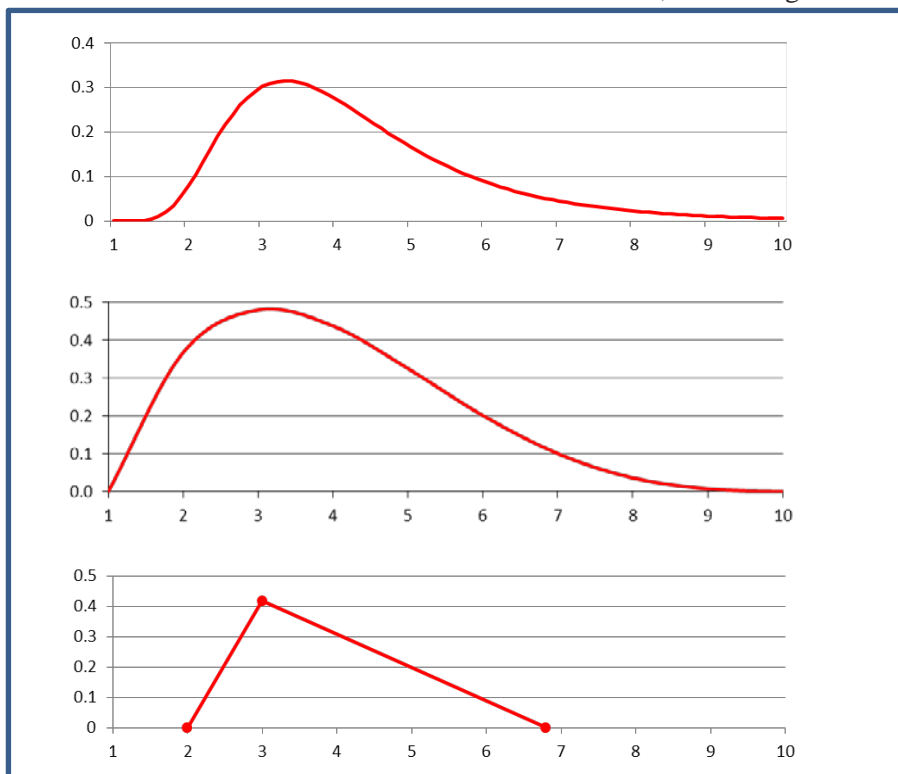

FIGURE 4. Example of probability distributions based on the three-point cost estimates for Epic *E4*. Lognormal (top), Beta (middle), Triangular (bottom).

you give is not too narrow. According to evidence[7], you should fix the low and high value first and then assess the probability of staying within these bounds, rather than fix a probability first and then find an interval in which there is that probability of staying within the interval. There is ongoing research on how to elicit people's perceptions of uncertainty in the best manner.

Obtaining estimates for the initiative from assessments on uncertainty drivers

We now want to use the above assessments on uncertainty drivers to construct initiative-wide pX values that we can plug into our benefit points and story points. For simplicity, we'll use triangular distributions generated automatically from the three-point estimates in Figure 3, and we'll assume that the drivers are independent of each other. These distributions are then given as input to Monte Carlo simulations.

A note on dependencies: There will be dependencies. Product elements are independent in that they can give individual business value, but they will likely depend on each other to give maximum effect. And your event uncertainty drivers will likely be interdependent; and so on. To model dependencies and the effects they have is outside the scope of this text, but you can still do meaningful uncertainty assessments on main effects. The independence assumption is reasonable if you use course-grained drivers as input to the simulation.

A Monte Carlo simulation will simulate a large number of project runs, say 10 000. It will do so based on your uncertainty assessments expressed as probability distributions. One simulated run will capture one possible project outcome according to one draw out of the hat from each of the supplied distributions. Over a large number of runs the more likely values according to the distributions will be drawn more frequently.
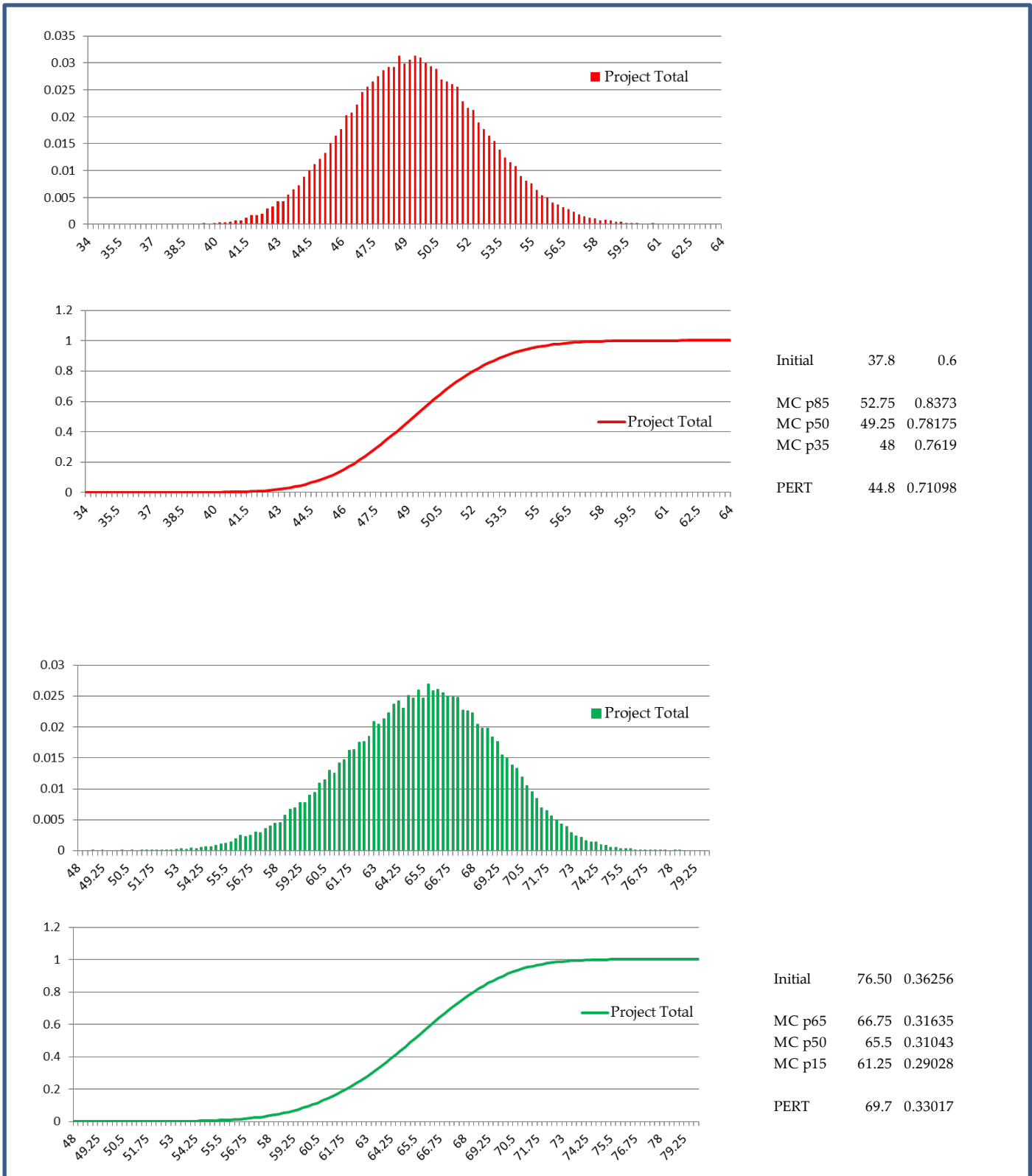
FIGURE 5. Monte Carlo simulations of cost (red) and business value (green), with histogram and cumulative curve, respectively.

This in turn will affect the distribution of total project outcomes.

After 60 000 iterations, Figure 5 (top) shows the histogram giving the proportion of times the project outcome was simulated to a given cost interval (each interval covering 0.25 million).

The cumulative curve of the histogram (Figure 5 second diagram) is generated by adding up the bar heights in the histogram from left to right and plotting the result. One can then easily read off project-level pX values. See the "How businesses construct project-level pX values" frame for common values. The p50 most likely cost estimate is here read off at 49.25 million, giving a SP value of 0.78 million. The p85 bad case estimate is 52.75 million, which gives a SP value of 0.84 million. The p35 good case estimate is 48.00 million, giving a SP value of 0.71 million.

Looking at the cumulative curve the initial project estimate of 37.8 million prior to uncertainty assessment is not likely at all. Further, the PERT method would be to compute the PERT EV for each three-point estimate in Figure 3 and add them to get a project total of 44.8 million,

which the project only has about a 7.5 percent chance of beating.

For business value, after 60 000 iterations, Figure 5 (bottom half) shows the histogram giving the proportion of times the project outcome was simulated to a given business value interval (each interval covering 0.25 million). From the cumulative curve (bottom), the p50 most likely estimate is 65.5 million (BP=0.31 million), the p15 bad case is 61.25 million (BP=0.29 million) and p65 good case is 66.75 million (BP=0.32 million). There is 0 likelihood of obtaining the initial project estimate of 76.5 million or better, and only about a 0.12 percent chance of obtaining the PERT estimate of 69.7 million or better.

This is a fictitious example, and it will not necessarily be the case that p*X* estimates give more pessimistic forecasts. However, the example demonstrates that if the project does have a perception of uncertainty, one should capture it, using e.g., three-point estimates, and use a sound method for integrating those uncertainty assessments into your base estimates (e.g., using Monte Carlo simulations). Using base estimates alone ignores project knowledge. Research shows that the PERT method as such may lead you astray[8], but the beta distribution it's based on can be used in Monte Carlo simulations.

Instantiate the points

Now you're ready to instantiate BPs and SPs with p*X* values. Figure 6 (top) shows benefit/cost according to initial estimates and good case, most likely and bad case p*X* estimates. Figure 6 (bottom) shows the corresponding planned realization curves.

So as a project manager who's

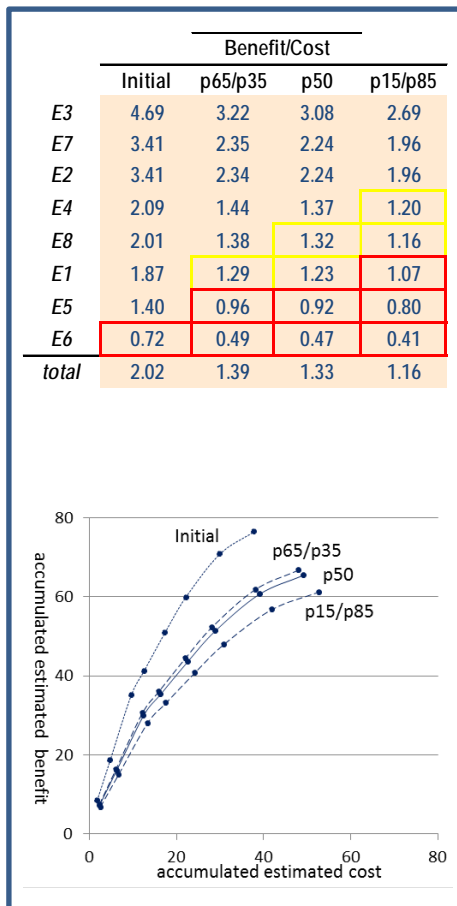|	Benefit/Cost			
	Initial	p65/p35	p50	p15/p85
E3	4.69	3.22	3.08	2.69
E7	3.41	2.35	2.24	1.96
E2	3.41	2.34	2.24	1.96
E4	2.09	1.44	1.37	1.20
E8	2.01	1.38	1.32	1.16
E1	1.87	1.29	1.23	1.07
E5	1.40	0.96	0.92	0.80
E6	0.72	0.49	0.47	0.41
total	2.02	1.39	1.33	1.16

FIGURE 6. Top: Benefit/cost obtained by instantiating BPs and SPs with initial estimates, good case (p65 for business vaue, p35 for cost), expected case (p50 for both business value and cost), and bad case (p15 for business value, p85 for cost). Bad business value/cost ratios framed in red, questionable ones in yellow. Bottom: Corresponding planned realization curves—accumulated planned business value plotted against accumulated planned cost.

received the p65/p35 order of battle, you should work with monetary values of 0.32 million for benefit points and 0.71 million for story points. If you're allowed to work with p50 estimates, then you should use 0.31 million for benefit points

and 0.78 million for story points. Both of these choices will impact when to stop construction and will affect how you prioritize backlogs across a portfolio.

Simple sensitivity analysis

Looking closer at the p50 scenario compared to the initial estimates, the estimates imply that *E5* joins *E6* in being questionable for production. If your stakeholders' uncertainty assessments were different you might have got p50 estimates giving an overall stronger benefit to cost ratio than your initial estimates, making *E6* more viable.

At this point, however, you can see what happens if you were to eliminate waste by discarding *E6* from the plan. In reality, you would wait to story elaboration time to eliminate waste, but it's still strategically useful to experiment at the level of epics.

The point to be made here is that you can run Monte Carlo simulations on your initial estimates with uncertainty assessments again—but with *E6* eliminated. For this example, you get a p50 benefit point value of 0.32 million on the remaining 195.55 benefit points and a p50 story point value of 0.82 on the remaining 50 story points. Using these values to recompute your epics backlog benefit/cost ratios, still renders *E5* as waste. Now, you can try eliminating *E5* instead, since *E5* has a cost uncertainty assessment that tends to higher values (Figure 3). Recomputing p50 estimates renders *E6* as waste. You can try eliminating both *E6* and *E5* and recompute p50 estimates, which gives you a backlog without waste at the level of epics. Figure 7 (top) summarizes this simple sensitivity analysis and waste

	per BP	per SP	Ratio	Benefit Total	Cost Total	Ratio Total	Waste
MC p50	0.31	0.78	0.397	65.50	49.25	1.330	*E6* (0.47), E5 (0.92)
MCp50 *E6* eliminated	0.32	0.82	0.396	63.50	41.00	1.549	*E5* (0.92)
MCp50 *E5* eliminated	0.34	0.81	0.422	61.50	40.25	1.528	*E6* (0.50)
MCp50 *E6* & *E5* eliminated	0.36	0.86	0.416	59.50	32.00	1.859	no waste

	per BP	per SP	Ratio	Benefit Total	Cost Total	Ratio Total	Waste
Initial	0.36	0.60	0.604	76.50	37.80	2.024	E6 (0.72)
E6 eliminated	0.36	0.60	0.604	70.90	30.00	2.363	no waste

FIGURE 7. Eliminating waste based on p50 estimates (top) and on initial esrtimates (bottom).

elimination with relevant values.

You can do this exercise even when you don't use uncertainty assessments. Then, you simply eliminate the epic with an unfortunate benefit/cost ratio (*E6*) and that's it, Figure 7 (bottom).

To incorporate uncertainty or not is a choice which has to made on grounds of how much effort one wishes to use on project governance and on how meaningfully stakeholders think they can assess uncertainty. If you incorporate uncertainty into your project metrics, you can enhance project learning; both by making uncertainty an explicit—and acceptable—part of project life, and by adjusting your numbers and plans to reflect uncertainty. You can use simple uncertainty assessment methods to generate pX estimates that you plug into your benefit points and story points, giving you various views on your project that you can report to your stakeholders. You can do this at any point during your project based on whatever is left of your backlog or on portions of your backlog. For benefit uncertainty, we illustrated using three-point estimates at the objective-returns relationship. When you do this for a backlog that has been under production, you have to adjust the amount of return that has been realized by the partly reached objectives. Since benefit points map to objectives and therefore returns, this can be computed automatically; a substantial advantage inherent in using benefit points.

[8] K.A. Kirtopoulos, V.N. Leopoulos and V.K. Diamantas, «PERT vs. Monte Carlo Simulation along with the suitable distribution effect», Int'l J. Project Organisation and Management, vol. 1, no. 1, 2008; pp. 24--46.

[1] J.E. Hannay, H.C. Benestad, and K. Strand, "Benefit Points: The Best Part of the Story," *IEEE Software*, vol. 34, no. 3, 2017; pp. 73–85.

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