

Benefit Points

– The Best Part of the Story –

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“Value for the customer” is the mantra in agile management and development. The product owner is involved along the way, and backlogs are prioritized, with the best of intents to maximize business value early and to eliminate waste. Yet, in many IT development projects bewilderment remains as to how exactly value for customer should be expressed in process decisions and in the delivered system. And projects continue to implement functionality which turns out to be off the mark or is never used. The reason, we say, is that there isn’t sufficient methodological support to determine and to monitor value for customer. Nor is there sufficient methodological support to link business value decisions to the mechanics of the development project.

You probably do cost estimates in a systematic way. In fact, cost estimates and productivity outlooks are routinely updated and monitored, and burndown charts can tell you when to start cutting down on scope. But chances are that you don’t treat business value with the same rigor as you treat cost; which is a paradox, given the central role proclaimed to business value in Agile.

The absence of an explicit treatment of business value means that you are likely to make decisions that confound business value with cost; such as using your burndown chart to cut functionality on grounds of cost rather than cutting or promoting functionality on grounds of business value. As in other areas in life, you’re in danger of perceiving (unconsciously) that a piece of functionality that is expensive also represents a lot of business value. Policy makers eager to show their capability to improve, regularly proclaim along the lines of “we’re putting an extra x million in this program (more than the previous policy makers)”, with no account of what value effects are intended in scope of the investment.

Past and recent disasters in development projects should make you painfully aware of the fact that spending more money doesn’t necessarily return more value. But, unless you have a sensible measure of business value for your backlog, you won’t be able to manage production with respect to business value. You’re proclamation of delivering valuable software to your customer will then not contain as much business value as it should.

THE PROJECT AND ITS PRODUCT ELEMENTS

Agile is about production for the customer. Actually, and more generally in today’s projects, agile is about production for a range of stakeholders; from enterprise managers, to system developers, deployers and maintainers, and out to end users, the society and general public in many cases. If you’ve done your requirements elicitation process accordingly, your set of requirements should be formulated from the perspectives of salient stakeholders. Such requirements are often formulated as user stories in some format or another.

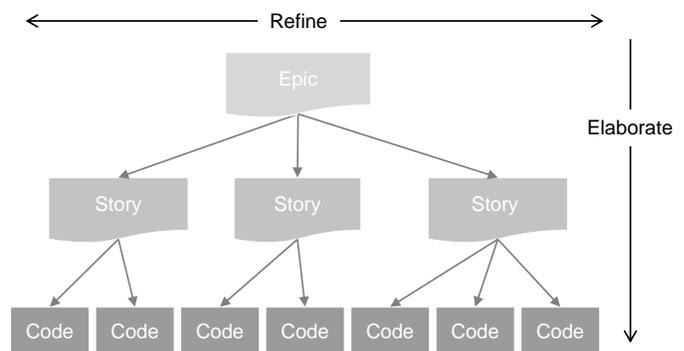


Fig. 1. Stepwise epic elaborate-refine tree for user stories. Epics are elaborated into stories, which by separating concerns between them, represent a refinement of the epic. Likewise, stories are elaborated and refined (developed) into code.

In agile projects, user stories often go by the name of *epics* and *stories*. Requirements specifications should reflect the project’s current, always limited, but evolving perception and knowledge of needs for the system under development. Epics are high-level requirements perceived at early stages of the project, typically at project inception, while stories are more refined and elaborated user stories reflecting the project’s understanding at more advanced stages. In turn, stories can be refined and elaborated into code. To avoid ill-founded requirements specification, you should defer requirements refinement and elaboration until the project has acquired sufficient knowledge. Stories sort under epics hierarchically; Fig. 1.

Stakeholder-centricity means that user stories should partition functionality into parts meaningful to those stakeholders in scope at a given stage. Thus, epics should partition functionality into parts meaningful for business processes with an eye on the business case, while stories should partition functionality into parts closer to specific user functionality. In the end, low-level stories and iteration or sprint tasks partition functionality into viable

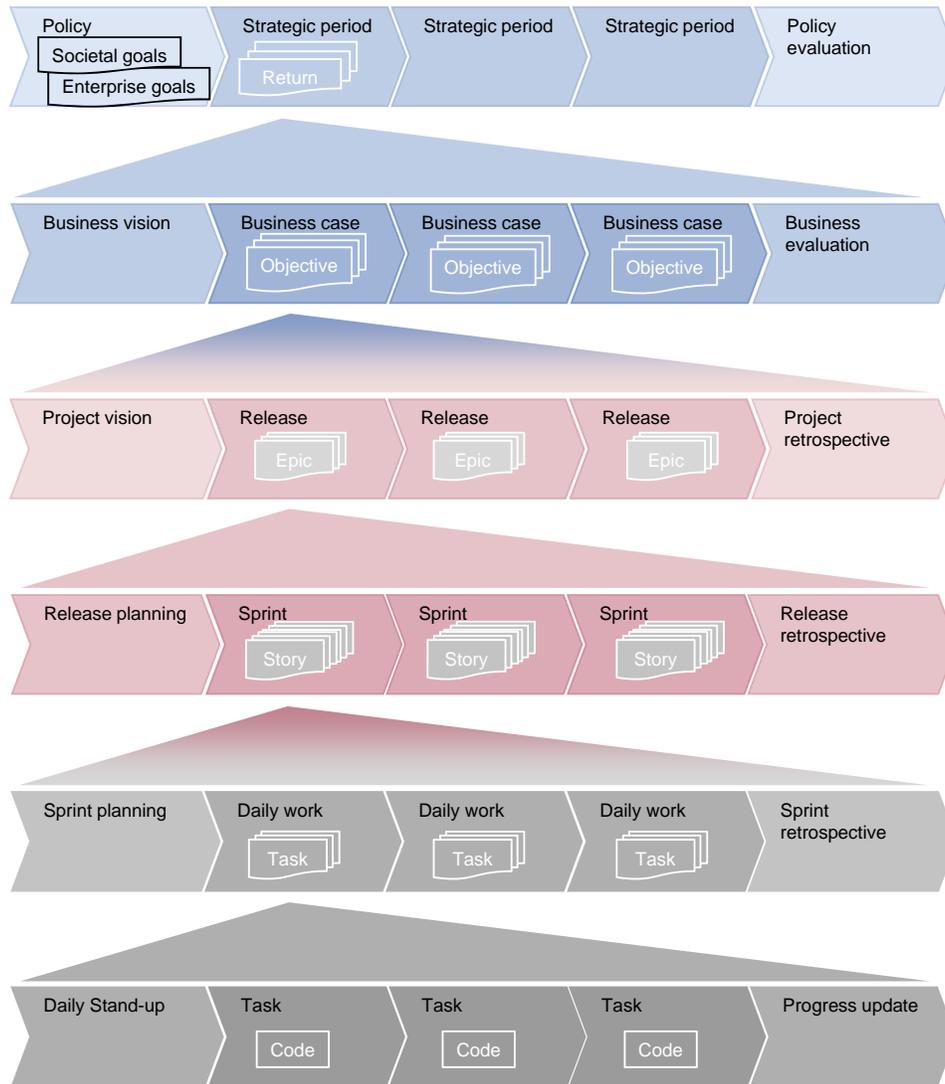


Fig. 2. Agile fractal (adapted from [21] and extended) with product elements.

pieces for code production.

For large agile projects, the agile fractal diagram [21] in Fig. 2 illustrates that agile management might occur at all levels of understanding. At the project level (red portion of Fig. 2), the epics backlog is distributed into releases according to priorities and dependencies in the project vision. The stories in epics, in turn, are distributed to sprints according to priorities and dependencies uncovered in release plans. At the technical level (grey portion of Fig. 2), sprint tasks are organized into daily work according to sprint plans, which result in code.

The difference in stakeholder focus between epics and stories is important for the techniques we will introduce below. By the way, this difference is also a substantial architectural challenge, since one starts with describing functionality according to enterprise architecture and would like to end up with functionality organized in sensible systems architecture. One can use various architecture and requirements handling frameworks; e.g., capability-based development [3] and service-oriented

architecture [23] to handle these challenges [10], but that is an important story to be told elsewhere. In any case, epics and stories are the driving artifacts of the project; the *product elements* which are chosen for production at any given time, and on which one measures the project's productivity and progress.

THE PROJECT AND ITS BUSINESS CASE

Meanwhile, the Agile Fractal can be extended upward into the enterprise level. In the blue portion of Fig. 2, iterative business cases following the business vision drive initiatives or projects. Business cases hold objectives for the projects. In turn, these *project objectives* are linked to return or revenue in strategic periods in line with the enterprise's strategic policies (light blue portion of Fig. 2).¹

¹The color coding in Fig. 2 is taken from the NATO Consultation, Command and Control (C3) Taxonomy of capabilities that includes enterprise-level and IT capabilities in the same picture.

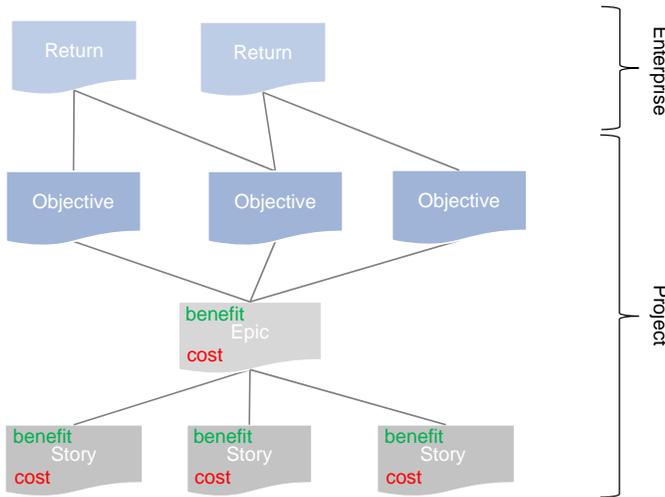


Fig. 3. Product elements with both associated cost estimates and benefit estimates.

The way this works is as follows: The Enterprise, in a certain strategic period, finds that to meet its goals it must initiate an initiative, perhaps in the form of an IT development project. Prior to launching the project, the enterprise develops a business case to mandate the project. The Business case holds project objectives which the project must meet in order to be of value.

BENEFIT POINTS AND STORY POINTS

Both epics and stories are usually assigned cost estimates, for example in the form of *story points*. We think you should also assign business value estimates—*benefit points*—to epics and stories; Fig. 3. A simple idea, that needs some consideration, which we'll go into shortly.

Benefit Points for Epics: the link to the Business Case

When estimating an epic's cost and business value, it is important that this is done in relation to the project's business case. If your project hasn't got a very elaborate one, it will suffice for this method that it has project objectives (a.k.a impact goals or effect goals).

For example, objectives for a development project developing a flight training simulator for an organization which provides flight training could be:

- Obj1*: Reduce time to flight readiness by 40%.
- Obj2*: Increase training frequency on catastrophic failure scenarios by 70%.
- Obj3*: Increase pilot through-put by 50%.

Objectives for an initiative to modernize the IT portfolio of a public service organization could be:

- Obj1*: Reduce average case processing time by 30%
- Obj2*: Reduce number of wrong case decisions by 90%
- Obj3*: Reduce average interaction time between applicant/application processor by 70%

In other words, project objectives express the organization's reasons for initiating the development project in the first place. The key point now is this: Epics' business value is estimated according to how much you think

an epic contributes to objectives. Since there are several objectives, this exercise is more complex than estimating cost. There are essentially two ways you can go about doing this: You can estimate an epic's contribution to all objectives seen as one. Or, you can estimate an epic's contribution to each objective one by one. The [How to Assign Benefit Points](#) frame illustrates the two ways of doing this, and gives a rationale for choosing to estimate epics' contribution to each objective in turn. If you do this, you should end up with a table with your estimates as in Fig. 4(a). For example, using the Fibonacci sequence familiar from planning poker, epic *E1* has been estimated to contribute to Objectives *Obj1*, *Obj2*, *Obj3*, respectively, 13, 5 and 8 benefit points; in all 26 benefit points. The total number of benefit points assigned in this manner is 211 in this example.

Objectives and Return: the link to business strategy

Having explicit, preferably measurable objectives, for your project is one of many signs of organizational maturity. To assign benefit points to your product elements in terms of those objectives is a first step to handling your project's generation of business value.

However, project objectives are the estimated effects of the project, and therefore live together, and as long as, the project. To link the project with the organization's long term goals, project objectives should be linked to business return as planned for in strategic goals. For example, planned return for the public service organization example above could be:

- Ret1*: Reduced number of man hours—50 million
- Ret2*: Reduced number of compensations—20 million
- Ret3*: Improved public image of organization—30 million

The project's objectives, once fulfilled, are expected to contribute to return for the enterprise to various degrees. For example, *Obj3* might be judged to be the main contributor to *Ret1*; say 20 mill., while *Obj2* and *Obj3* are estimated to contribute relatively less; say 10 mill. each. Together the project's objectives, if fulfilled, are estimated to contribute 40 mill. to the strategically planned 50 mill of *Ret1*. The remaining 10 mill. might come from other initiatives. Table 4(b) illustrates the example. The total strategically planned return in *Ret1*, *Ret2* and *Ret3* is 100 mill. The project's objectives *Obj1*, *Obj2* and *Obj3* are estimated to contribute 21.5 mill., 25 mill. and 30 mill., respectively, to that return; in all 76.5 mill. Thus, the project's objectives, once fulfilled, contribute unevenly toward the return of the project, and only partly to the enterprise's strategically planned return.

Fig. 4(b) is the responsibility of the enterprise, not the project. It represents the interface between the project and the business in terms of its goals as an enterprise. It is the link between the strategic level of the enterprise and the business objectives of this particular project. That link should be generated by strategic management together with the project's management.

How to assign benefit points

The key to assigning benefit points is to assess how much you think each epic contributes to the project's objectives. To help you think in terms of objectives even when writing epics, you can use a syntax that explicitly states objectives; for example,

Epic: **As** <stakeholder A > **I can** <perform actions d > **by using** <System S > **to** <perform actions s in S > **in order to** <contribute to objectives O >

We recommend estimating an epic's benefit according to its contribution to each specific objective. This generates a matrix of estimates, as in the following table:

	Objectives		
	Reduce average case processing time by 30%	Reduce number of wrong case decisions by 90%	Reduce average interaction time between applicant/application processor by 70%
<i>Epic</i>			
As Applicant I can secure my identity in application process by using the system to authenticate myself in order to ...	13	5	8
As Applicant I can start with a prefilled application form by using the system to retrieve and autofill all available and relevant information in order to ...	21	21	3
As Case Processor I can find all relevant information for a case by using the system to retrieve applicant information from all relevant and permissible data sources in a single search in order to ...	21	2	5
As Division Manager I can manage productivity in my division by using the system to view statistics to monitor time and quality of case processing in order to ...	8	8	2

To follow best practices, use relative sizes. Also, use a size scheme that the project is familiar with. In our examples, we're assuming that the project already uses planning poker story points in the form of Fibonacci numbers.

An alternative to considering every objective, would be to estimate an epic's benefit according to all objectives in one go; as illustrated in the table below.

	Objectives
	The three objectives seen as a single objective
<i>Epic</i>	
As Applicant I can secure my identity in application process by using MyID module to authenticate myself in order to ...	8
As Applicant I can start with a prefilled application form by using MyID module to retrieve and autofill all available and relevant information in order to ...	13
As Case Processor I can find all relevant information for a case by using CrossSearch module to retrieve applicant information from all relevant and permissible data sources in a single search in order to ...	8
As Division Manager I can manage productivity in my division by using QCon module to view statistics to monitor time and quality of case processing in order to ...	5

Ostensibly, there are pros and cons for both approaches. Considering each objective specifically lets you think in more detail, but increases the complexity of the benefit estimation process substantially, since you have to perform not just one estimate per epic (as suffices for cost estimates), but one estimate for each objective. In addition, the resulting matrix of estimates should be consistent in that the relation between estimates should make sense regardless of whether you read the matrix horizontally or vertically. Feedback from practitioners using the technique indicates that some people prefer to think horizontally (how does a given epic contribute to each objective), while others prefer to think vertically (how do the epics contribute to a given objective). We have yet to investigate if one way is better than the other. On the other hand, considering all objectives as one single, perhaps, fuzzy entity, may mean that you as a stakeholder are not really able to use your expertise and knowledge of the domain properly, even though the estimation process is substantially less complex.

So which should you choose? There are theoretical grounds for choosing the first, more complex approach. Theories of judgment and decision making predict that people will be affected by a host of unconscious biases which are likely to affect your judgments in ways you can neither predict nor control [12], [9]. These biases add considerable noise to judgments. However, if you're able to use *task-specific* knowledge at key points in your judgments process, you should be able to boost the conscious elements in your judgment process, so that your decisions are the results of knowledge to a greater extent [17]. This is a case for strengthening the signal of conscious knowledge-based process over the noise of unconscious biases. Considering each objective in turn stimulates that conscious signal.

Empirically, a controlled experiment we conducted indicates that the first approach generates estimates with less inter-rater variance than what the second approach does. This phenomenon may be the manifestation of less noise as theorized above. Also, less variance between job performers is an indication that a task has been defined in a way so that expertise both is applicable and can be built [13], [5].

Your stakeholder team will likely need a few moments to get calibrated on the scale you're using (perhaps starting with a reference epic). But once at cruising altitude, our experience is that it takes a couple of hours to assess 10–20 epics on 4–6 objectives.

CORE PRACTICE:
Benefit Point Estimation for Epics

Objective	Planned Return			Sum	Weight	
	Ret1	Ret2	Ret3		Project	Enterprise
Obj1	50	20	30	21.50	0.28	0.22
Obj2	0.2	0.3	0.3	25.00	0.33	0.25
Obj3	0.4	0.2	0.2	30.00	0.39	0.30
sum	0.8	0.7	0.75	76.50	1.00	0.77

(b)



Epic	Objective			sum
	Obj1	Obj2	Obj3	
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
sum	84	60	67	211

(a)



Epic	Objective			sum
	Obj1	Obj2	Obj3	
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
sum	59.30	68.95	82.75	211

(c)

Fig. 4. Core Practice *Benefit Point Estimation for Epics* and example. (a) Epics' contribution to objectives, (b) Objectives' contribution to returns, (c) Resulting balanced benefit points. Expert estimation on white background. Tool calculation on green background.

If your project is linked this way to wider enterprise goals, then the fact that some project objectives are more worth than others must be reflected in how you deal with generating business value from the project.

Balanced benefit points for Epics

That objectives are not equally important can be reflected in your business value estimation for epics by balancing the benefit point distribution on epics accordingly.

The two rightmost columns in Table 4(b) show weights of objectives according to how much they contribute to return. The *Weight Project* column shows the proportion for each objective relative to the total return of the project, while the *Weight Enterprise* column shows the proportion for each objective relative to the strategically planned return for the enterprise. You can choose which to use. Here, we use the former, since it gives a greater degree of differentiation in relative value judgments, but the enterprise perspective of the latter more explicitly links the project to the totality of enterprise goals.

When objectives contribute unevenly to return, a benefit point given with respect to one objective will represent a different amount of business value than a benefit point given with respect to another objective. To keep things manageable, we recommend to balance the number of benefit points for each epic so that a benefit point holds the same business value regardless

of which objective it was given for. Also, keep the total number of benefit points assigned constant so that its the redistribution of points over epics that represents the balancing.

This should all be done automatically in your spreadsheet or project management tool. For each epic and objective, do the following: First, to reflect that objectives contribute unevenly to return, multiply the epic's benefit points given for that objective with the objective's weight (for Epic *E1*: $13 \cdot 0.28$). Second, divide by the total number of benefit points for that objective ($13 \cdot 0.28 / 84$) to adjust, so that the benefit points assigned under each objective represent that objective's expected contribution to returns. Third, multiply by the total number of benefit points ($13 \cdot 0.28 \cdot 211 / 84 = 9.18$)² to scale up so that total number of benefit points remains constant. Fig. 4(c), which should be automatically generated in your spreadsheet or project management tool, gives you the resulting balanced benefit points for our example. You'll see that the proportion of benefit points under an objective to the total number of benefit points assigned corresponds to that objective's proportion of expected return (for *Obj1*:

²If you calculate $13 \cdot 0.28 \cdot 211 / 84$, you get 9.14. All calculations are performed in Excel at its built-in large precision, but presented at two-decimal precision for legibility. So, 0.28 is the ratio of $21.50 / 76.50 = 0.28104575\dots$ at two-decimal precision, and $13 \cdot 0.28104575\dots \cdot 211 / 84 = 9.17748\dots$, which is 9.18 at two-decimal precision.

MISHRI—Model for Integrting Soft and Hard Return on Investment.

Return *Ret3* in the example below is a typical qualitative return. It does not have direct reference to quantifiable measures. Since qualitative returns may be an essential part of business value, it is important to be able to include qualitative returns in our scheme.

Ret1: Reduced man hours 50 mill,

Ret2: Reduced number of monetary compensations 20 mill.

Ret3: Improved public image of organization ?

Our entire methodology is based on simple methods that are overcomable for human cognitive resources. Virtually all the expert estimation you're required to do is based on relative comparisons. This is also what we recommend that you do to quantify qualitative returns. For this you need at least one quantitative return, such as *Ret1*. You can now ask yourself how important *Ret3* is relative to *Ret1*. If it's equally important, you should set its monetary value as 50 mill. If it's less important, you can ask the same question relative to *Ret2*. Perhaps you assess that *Ret3* is more important than *Ret2*, but closer to *Ret2* than *Ret1*; say by one third of the way between the two, which implies a monetary value of 30 mill. In other words, you use the quantitative returns that you have as markers up against which you compare qualitative returns.

Relevant stakeholders should be involved in this process, and you can use similar techniques as for the other expert estimates to be provided in our approach.

Including soft returns in this way means that you can take into account their influence on project objectives. In this way, soft returns will influence the backlog order. This is exactly what we're after. However, you can later choose if you want soft returns to be included in actual returns calculations. This may not always be appropriate, because there will not necessarily be actual cash flow in from soft returns. We leave that discussion for later. By the way, it's easy to include and exclude soft returns (and compare their effect). For *Ret3*, simply set its value to 0, and see how the automatic calculations in your tool change.

59.30/211 = 0.28). The general balancing formula for an epic E_i and Objective Obj_j is:

$$\begin{aligned} & \text{balanced BP}(E_i, Obj_j) \\ & = \text{BP}(E_i, Obj_j) * \text{weight}(Obj_j) * \text{total}(\text{BP}) / \text{total}(\text{BP}, Obj_j) \end{aligned}$$

There are reasons you might not want to apply the second step above. The fact that the number of benefit points under an objective deviates from the expected return might reflect that your stakeholder team thinks the epics don't have that potential to fulfil the objective. The second step assumes that the project should deliver fully on its objectives, and that differences in the number of benefit points assigned under each objective is due to our coarse-grained, but "good enough" approach to estimating business value. The second step therefore neutralizes these difference by adjusting to total fulfilment of objectives. You might omit the second step if these differences are large, and you think this signifies unequal or partial fulfilment of objectives. This is particularly relevant if the objectives are not project-specific, but represent objectives across multiple initiatives. In this discussion though, the returns, rather than objectives, are global, and it is on returns that partial fulfilment is expressed. But if you do omit the second step, your third step is different. See if you can figure out how to do it!

Qualitative Return

Now what about "soft" returns? It is commonplace to have expected returns such as *Ret3* above: Improved public image of organization, or, say, *Ret4*: Increased information infrastructure capability in society. Such expected returns may be more important than quantitative

financial ones, for example, in terms of political justification for initiating a development project or in terms of goals of environmental and ethical sustainability.

The problem is that such returns may be very hard to quantify. Sometimes explicit quantification in terms of monetary value of qualitative returns is required by law; for example in government-funded development projects, where there are obligations to follow social-economic models for analysis of societal benefit. However, insisting on hard quantification of qualitative values may be perceived as practically impossible and lead to such returns being omitted. In line with satisficing rather than optimizing [20] and simplicity, we propose a method for implicitly quantifying soft returns. The idea is the same as that presented for a slightly different context in [4]. Our approach is sketched in the MISHRI frame.

CORE PRACTICE: BENEFIT POINT ESTIMATION FOR EPICS

To sum up, we've introduced benefit points for epics. Using simple methods, you can assign them based on the project's business case using stakeholder knowledge and project expertise. This comprises a *core practice* along side story point estimation (another core practice). Now, since you can assign both cost and benefit estimates on your product elements, you are equipped to monitor and learn from your project so that you can work towards generating as much benefit as possible; in addition to controlling cost.

A key feature to this new core practice is a loosely coupled approach that allows you to focus on one relationship at a time. You are to focus on the relation between epics and objectives, disregarding the relation between objectives and returns. You are to focus on the

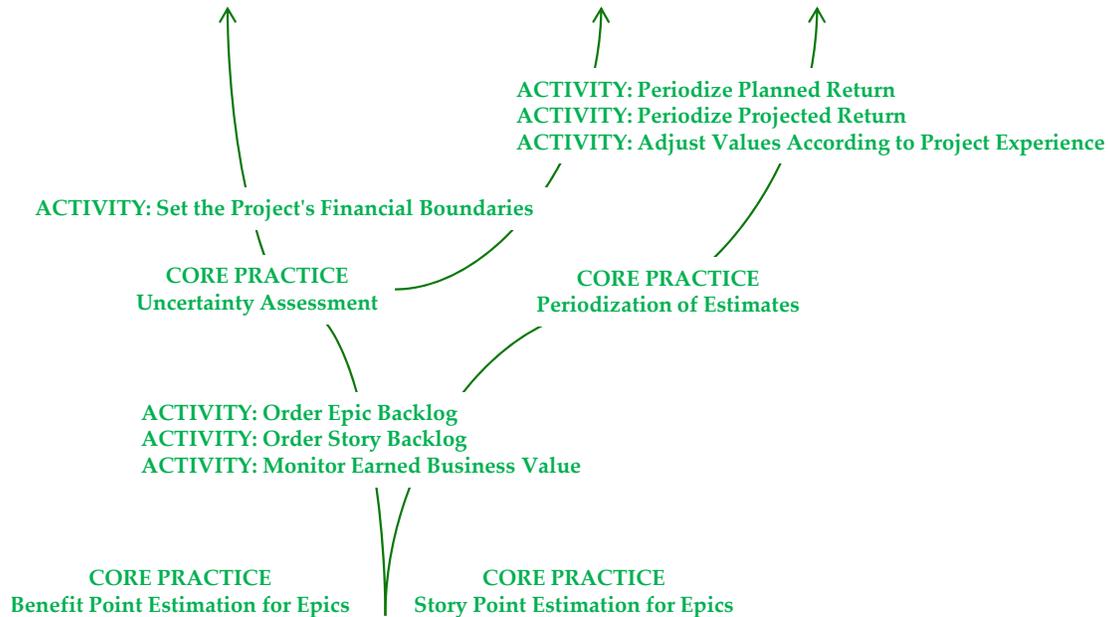


Fig. 5. Core Practices *Benefit Point Estimation for Epics* and *Story Point Estimation for Epics* give rise to monitoring and project learning activities and further core practices.

relation between objectives and returns, without having to think about product elements. The combination of your assessment of the two relations is automatically generated as in Table. 4. In a triannual workshop for industry on PRINCE2 and Agile Management we've given this approach to an excess of 240 (and counting) project/product owners/managers. Participants are generally new to this approach and get stranded from time to time when inadvertently attempting to combine these two steps in one go: Trying to assess an epic's contribution to an objective, while at the same time taking into account that objective's contribution to various returns, and reflecting all this in the number of benefit points for the epic, is hard. Trying to do all that for several objectives is near impossible. For similar reasons, it's important to clearly delineate cost and benefit as separate concerns when providing estimates. See [Experience and Other Approaches](#) frame for more on experiences using this core practice.

Throughout this discussion, those portions of tables and figures that you are required to provide estimates for, so-called *expert estimates*, have white backgrounds. Portions that are automatically calculated by your tool (Excel perhaps), have green backgrounds. You will see that there is a modest number of expert estimates that need to be provided and that they are not complicated measures, but intend to capture the project's knowledge currently available. For more on the underlying principles of what is presented here, see [Satisficing, Fast, Frugal and Simple](#) frame.

What next...

Fig. 5 shows the two core practices of benefit point and story point estimation as the basis for better project

management activities and further core practices. These will put you in a position to challenge for real, ingrained project management activities that go counter to agile. In later discussions, we'll address some of the possibilities. On that journey, the next way point will be activities that integrate benefit points in backlog organization so that you can work to produce more business value relative to cost and reduce waste. Other paths will look at further core practices and activities that allow you to plug benefit and cost uncertainty estimation and periodization into the scheme.

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Experience and Other Approaches

In Norway, agile is more or less “state of practice” in the public sector and in large corporate enterprises. Even if relatively new, the concepts presented in this paper have started to appear in systems development projects. In a large telecom company, several projects used benefit points as described here to estimate epics’ contribution to business objectives and subsequently used this for backlog prioritization—one of the projects (a systems architecture restructuring project) also used the MISHRI model. The feedback from project members is that the benefit estimation process yields vast improvements from earlier practice; in particular for a better understanding of project objectives and for a clearer perception of the expected value of project deliverables. It also contributes to aligning project and business resources with respect to which impacts to expect from project deliverables. In a large project in the public sector, the product owner asked the project to incorporate 7 epics in the final stages of the project. The epics were perceived to have high benefit, and after a cost analysis, they were incorporated into the backlog at the appropriate place. Some of the functionality in the existing backlog was covered (better) by the new epics. The result was that, due to the benefit/cost analysis conducted, the low benefit/cost remainder of the backlog (after the seven new epics) was cancelled, saving the product owner approx. EUR 5 million. That particular project did not use our methods directly, but maintained a tactic in line with what we are presenting. Our present scheme based on benefit points is designed to facilitate, systematize and prepare for these kinds of wise decisions.

In the PRINCE2 and Agile Management certification programme “IT Project Professional” (ITPP), e-learning and a workshop are devoted to the core practice and applications of it. Since the beginning in 2013, over 240 candidates have passed the certification exam. There is reason to believe that practice and experiences with the approach will increase in the years to come when certified project managers, product owners and others start applying their new skills.

“Agile at scale” frameworks such as Large Scale Scrum (LeSS) and Scaled Agile Framework (SAFe) present alternative models for prioritizing Product Backlog Items (PBIs). In LeSS, you are prompted to “with *relative value points* (RVPs) as a lightweight proxy for ‘value’, use *planning poker* to experiment with *relative value points* (RVPs) and their estimation” [15, p. 139]. This alternative is left undetailed though, and it is argued that value is not a simple attribute or number, and one is advised to move beyond the simplistic notion of “value” toward multiple weighted factors, such as stakeholder preferences, strategic alignment, relative points for value and effort, and risk. In SAFe, one argues that prioritization of PBIs should be based on a number of parameters. Building on the concept “Cost of Delay” [19], one presents an algorithm to compute the sequence in which PBIs should be implemented [16]. The approach is called “Weighted Shortest Job First” (WSJF):

$$\text{WSJF} = (\text{User-Business Value} + \text{Time Criticality} + \text{Risk Reduction-Opportunity Enablement Value}) / \text{Job Size}$$

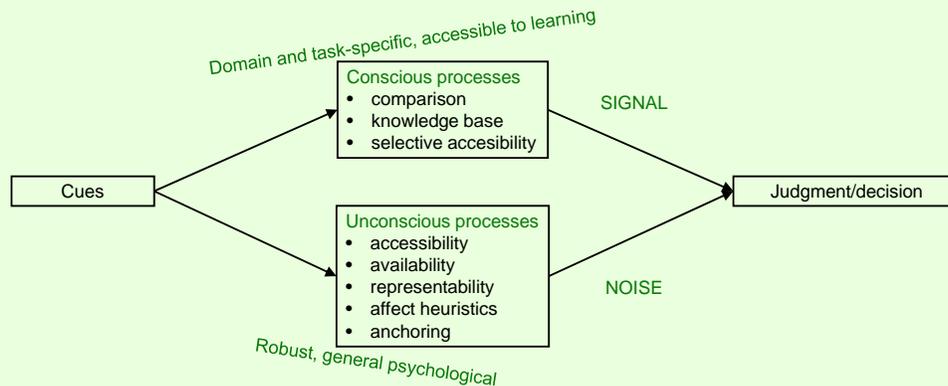
where the parameters are estimated with relative sizes using the Fibonacci sequence. The complexity of these measures contrasts to what we are advocating. Combining benefit, cost, risk and duration parameters is not so easy to grasp, and mixing different parameters may inhibit measuring, reporting and project learning. We designed the current framework to be intuitive and straightforward to maintain, and key to this is that cost and benefit parameters are clearly separated. Our approach is minted toward supporting the stakeholders’ conscious processes; see *Satisficing, Fast and Frugal* frame. The advantages of this will be even more salient when applied to progress reporting, which is the topic for a sequel to this article.

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Satisficing, Fast, and Frugal

Benefit and cost estimation sort under judgment and decision tasks. Such tasks are inherently difficult and often so-called *inconsistent* (different people develop differing successful strategies) [1], [2] or *ill-structured* (hard even to define successful strategies) [11]. Research shows that practitioners on inconsistent and ill-structured tasks may spend half their careers apparently *not* learning and *not* improving performance beyond, perhaps, a very narrow subset of (consistent) tasks.

Judgment and decision making are seen to follow two types of cognitive processes (summarized in the figure below): Conscious processes that are sensitive to domain knowledge [17], [14] and learning [5] on the one hand and unconscious processes that are driven by general psychological traits, are domain unspecific and hard to unlearn, even when you are aware of them [12], [7] on the other hand. To improve on this situation, one must target the conscious processes by facilitating increased use of domain knowledge (signal), while decreasing the effects of the offsetting unconscious processes (noise). But due to its inconsistent nature, judgment and decision making is challenged by a weak signal to noise ratio in the outset, because it may be unclear how to access and use domain knowledge.



Therefore, we design our methods with the aim to support stakeholders in using relevant knowledge in a systematic manner. Stakeholders are required to provide a modest number of relatively simple expert estimates and assessments. From these, various measures are calculated automatically in a transparent manner. We advocate methods such as relative and pairwise comparison that help stakeholders tap into domain knowledge and use it in assessments. Pairwise comparison is a core element of judgment conscious cognitive processes [17], so it makes sense to use methods that directly support that process. To strengthen conscious comparison, it may also be beneficial to use methods that focus on differences; see e.g., the repertory grid technique [6] if you are interested in this. We also advocate structured group methods that reduce noise [22].

The underlying methodological principle in our methods is in line with the fast and frugal heuristics approach to judgment and decision making [8], to naturalistic decision making [14], and to *satisficing* rather than optimizing [20]. All of these approaches acknowledge the almost impossible task of supplying sufficient reliable information required for predicting accurately how to proceed in complex situations. Both human decision makers and tools fail to yield good results in uncertain circumstances when attempting to gather and analyze all relevant data correctly. Instead, it is argued, human cognitive judgment is geared toward processing unreliable partial information rapidly and with sufficient accuracy for the purpose at hand, and tools should rather be designed to support this mode of decision making rather geared toward analyzing the totality of the situation.

If you were to implement these methods in a Decision Support System (DSS), it would be a so-called *passive, communication-* and *data-driven* DSS [18], in contrast to a DSS that runs advanced rules, procedures or simulations intended to generate solutions that replace parts of the decision process.