Measuring Innovation ROI:
#2 Small Picture

Here is the second part of the Innovation ROI calculation story we started in August (Reference 1). The aim of that first part was to examine why the ROI calculation is so difficult when it comes to innovation and the enormous variety of different scenarios an innovation project team might find themselves caught up in. The aim of this second part is to show where we've got to in terms of distilling all the different scenarios into some kind of manageable whole. From an economist's perspective, let me say from the get-go that we haven't reached anything like the Holy Grail 'universal' solution their profession seeks. There is no single equation that will allow a meaningful calculation to be made. From all the dead-ends, diversions and rabbit-holes we've found ourselves travelling down the last few months, we don't believe there ever will be. The 'right' innovation ROI calculation depends on a number of factors. In this article we will be talking about three. Namely, the hierarchical level ('Mode') of innovation, the type of innovation, and the Level of Innovation Capability of the innovator. In our deliberations, we have identified five distinctly different innovation Modes, two types and, as anyone familiar with our Innovation Capability Maturity Model (ICMM) will know, five different Levels of Capability. Which, if my mathematics is right, gives us 50 different ROI calculation options – Figure 1. Already I can see the economists and accountants leaving the building. Au revoir, deluded 'theory of everything' aspirants.

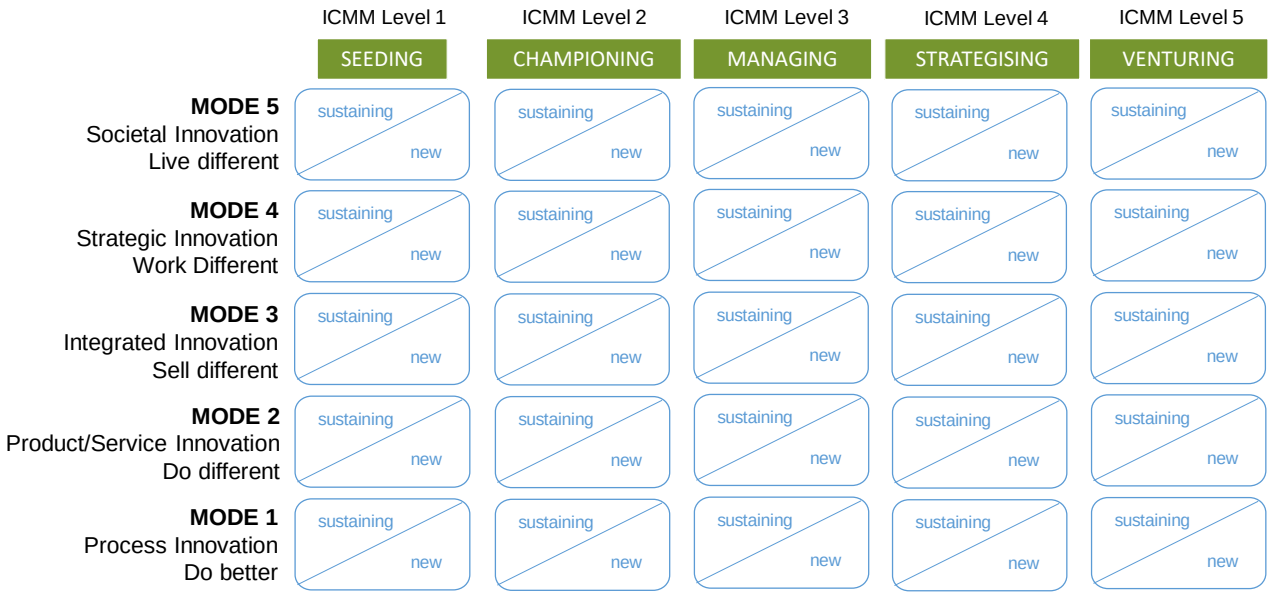

Figure 1: Different Innovation ROI Calculation Scenarios

For anyone that's still here, I'm reminded of Einstein's famous aphorism, 'everything should be made as simple as possible, but not simpler'. One of the reasons that no-one has cracked the innovation ROI formula is that there isn't a formula. There are fifty. Which, I don't know about you non-accountant, non-economists that are still with me, sounds like a recipe for the dullest, most tedious article of all time. This has been a worry. Where we've got to is that, spoiler alert, I don't think we're good enough to make this into inspiring literature. Fortunately, there's a way of doing it that doesn't involve us having to describe each of the fifty different scenarios in toe-curling detail. Talking about three or four and

then adding a couple of Tables should do what we need them to do. Even so, probably safest to buckle-up, this is not going to be the easiest ride…

Aah. Wait a minute, I lied already. We need to start with a couple of definitions.

First up, one of the first things that will be important in measuring ROI of an innovation is the pulse rate of the domain in which the new solution is being deployed. We've talked about innovation pulse rates several times in previous ezine articles, and next month we will be updating our list of pulse-rates for different industries. In crude terms, 'pulse rate' is the period of time over which an S-curve unfolds – Figure 2:

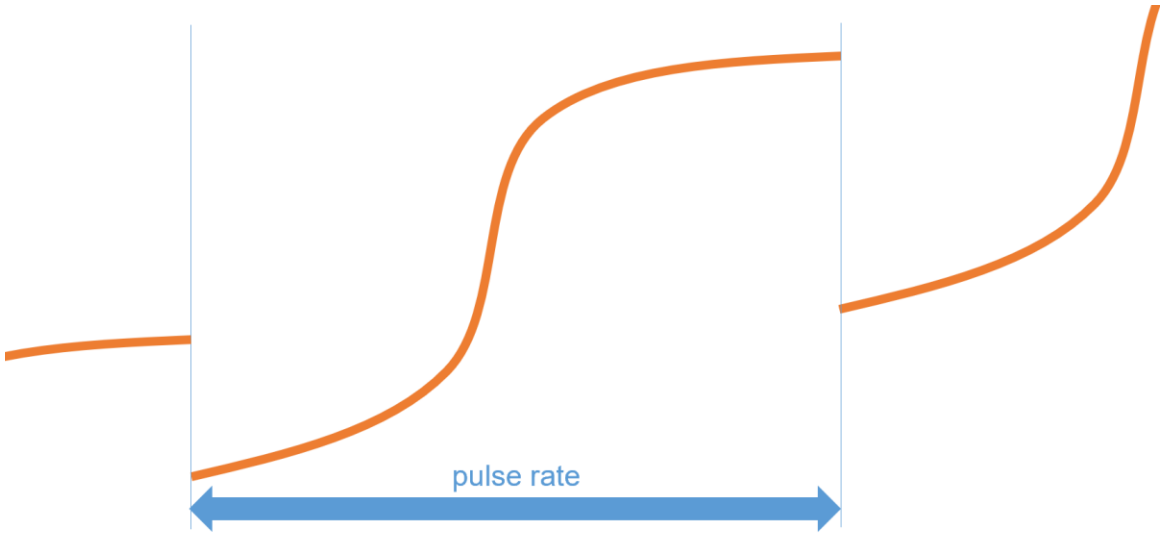

Figure 2: Innovation 'Pulse Rate'

The need to know (or have a good estimate of) this number gives an immediate problem for many organisations since it is not a well-known phenomenon. The lack of knowledge – at management levels at least – is one of the reasons why the world of innovation ROI calculation is in the state of dysfunction it currently finds itself in. We're going to have to make the problem deeper here when we say that the pulse rate numbers are going to be different *within* as well as between industries. In line with what's going to happen next, when it comes to calculating pulse rates, we need to recognize, to take a specific example, that if we're innovating a new 'car' we'll find that the prevailing pulse rate (about 5 years) is not the same as if we zoom-in and look at some of the sub-systems found within the car. So, if we were looking to design a new head-up display to be installed in a car we'd find that the pulse-rate of the laser/head-up-display sector is much more rapid (about 18 months at the moment). Conversely, if we decided to zoom-out and instead of thinking about innovating 'car' we decided to innovate 'urban mobility' then we'd find ourselves dealing with a pulse-rate that is quite different again. Depending on the Mode of innovation project being considered, those tasked with estimating likely ROI may need to have an appreciation of not just the pulse-rate of the solutions that will emerge from the completed project, but also the pulse-rates of the systems at higher levels in the hierarchy of S-curves. A team developing a new head-up display, for example, may be able to get away with just knowing the pulse rate of head-up displays, but far better if they also know the pulse-rate of the target car into which the display will be installed, and better still if they also have an appreciation of the 'mobility' S-curve. Let's worry about the details of that when we get to it.

In the meantime, second up, we need to dig a little deeper into the definitions of the five different Modes of innovation that innovators need to be aware of.

Mode	Characteristics	Example: Education	Example: Mining
1	Incremental changes, deployable immediately without disturbing the current system. Unlikely to be patentable, and if it is, it will be simple to design around. Very likely at the internal 'process' level inside the organisation	New time-tabling software	Drill-bit change-over process improvement
2	A moderate step-change, with a strong likelihood that some kind of complicated contradiction has been solved. The solution is likely to be patentable. Implementation, however, is not likely to be straightforward and may well only be possible when the next system-level pulse is able to happen. A Mode 2 innovation is, however, unlikely to prevail into the next system pulse after the one in which it is introduced.	Switching from blackboard teaching to iPads	A novel kind of drill-bit
3	A strong 'in-domain' solution, offering significant protectability and protection that is able to prevail until such times as the next hierarchical level up system pulses to a new paradigm	A new strategy and methodology for teaching Mathematics	Resonance-enhanced drilling – which also demands a shift to new drilling processes
4	Paradigm-shifting innovation in which customer outcomes are delivered in new ways, and as a consequence, massively disrupting all sub-system and other lower hierarchical level solutions. When the automotive industry, for example, shifts from 'selling cars' to 'mobility' this shift will cascade through all levels of the industry. Mode 4 innovation demands full acknowledgement of the inherent complexities of the world, and deploys procedures and protocols consistent with what is required to influence complex systems in the desired directions	Shifting from teaching the 3Rs to the 3Ss	Autonomous mine
5	Societal-level step change solution. Such pulses happen relative rarely, but when they do the cascade effect down to lower Mode solutions is intensely traumatic and the cause of much disruption. It has long been believed that crisis is the primary trigger for any kind of innovation. Mode 5 innovation seems, to date, to be absolutely dependent on such societal-level crises.	Education without schools	Iron shifts to composite and other alternative materials

Table 1: Characteristics Of Different Innovation Modes

Close followers of TRIZ will recognize some similarity between these five Modes and the 5 'Levels of Invention' first described by Genrich Altshuller. The similarities are close enough for most practical purposes that if you're familiar with the Altshuller taxonomy (or our evolution of it over the years), it makes for a sensible proxy for Table 1. That said, the big 'watch-out' is the greater emphasis in this new taxonomy of the nested hierarchies of S-curves found in the real world, and the fact that a high-level innovation, especially in Modes 4 or 5, will have an inevitable explosive impact on the design of all the systems and sub-systems at lower levels in the hierarchy.

Pragmatically speaking, given the fact that most enterprises exist today at the lower end of the Innovation Capability Maturity scale, any talk about nested hierarchies of s-curves pulsing at different rates is very unlikely to be welcomed by the senior leadership team (even though it perhaps ought to be). What this means is that we need to take account of the prevailing Innovation Capability Level of an enterprise in order that we choose an ROI calculation method that is meaningful, valid and is accepted by those at the top of the organisation tasked with writing a cheque so that the innovation team can get on with the job.

We'll start that exploration with a look at the place where close to 80% of enterprises on the planet currently find themselves, ICMM Level 1 and the most basic, Mode 1 type of innovation:

ICMM Level 1, Mode 1 Sustaining Innovation

The primary purpose of any ICMM Level 1 innovation project is to demonstrate an ability to deliver value to the organisation as a whole. At the same time, the team, already likely to be suffering from some kind of stigma about not contributing to the overall good (especially from the SLT), need to keep things simple enough that it doesn't come across as though they are trying to manipulate the figures to make them look better than they actually are. Falling into any kind of, 'well, they would say that wouldn't they' trap is a disaster to be avoided at all costs. Let others outside the team know what the calculation method is as close to the beginning of the project as possible, and don't change the rules halfway through the project or, worse, near the end when things haven't necessarily gone to plan. Figure 3 shows the basis of a calculation experience tells us is 'fair' and understandable by outsiders. The first thing to estimate is the green area of the graph, which is all about how we estimate revenues to evolve were the project *not to* happen and *nothing changed* within the organisation. The critical thing to introduce into this calculation is the timing of the next s-curve pulse, and specifically, how far into the future is that pulse likely to be? After that pulse, the system is likely to be replaced by another (Mode 2 or higher) system and as a consequence, it is appropriate to assume that the net revenue received beyond this pulse date will decline rapidly as the old system is progressively replaced by the new.

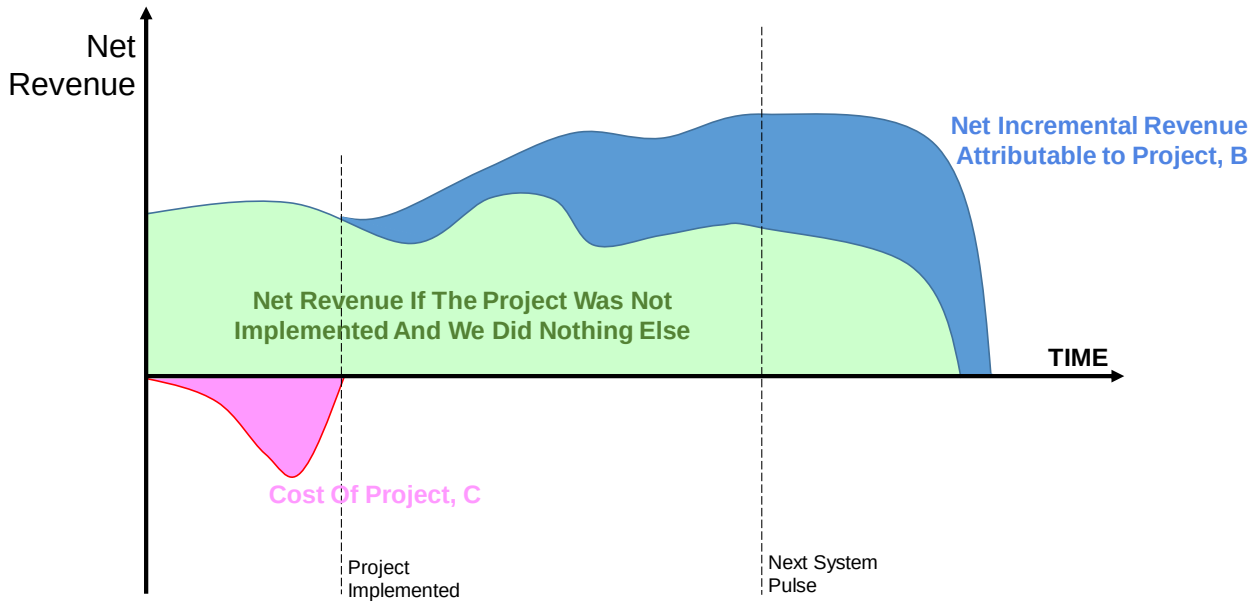

Figure 3: Outline ROI Calculation For ICMM Level 1, Mode 1 Innovation

Next up, the easiest calculation to make relates to the cost, C of the project that is about to be undertaken. As ICMM Level increases, the sophistication of this calculation will increase (as we will see later), but at Level 1, it is best to confine the calculation to things that others will recognize as the 'actual costs' of the work – namely the cost of labour, cost of any expenditure on hardware, test equipment, customer surveys, testing, and, usually, the cost of handing over the 'finished' solution to those tasked with implementing and productionising it. Given the likely philosophy of any Level 1 innovator is akin to 'Pirate's Cove' (or Jugaad Innovation in India) there are strong incentives to keep physical costs to a minimum by being very resourceful and making use of whatever is laying around, and likewise, when it comes to labour costs, beg, steal and otherwise cajoling people to 'lend' you some of their precious time for free. The aim, ultimately, is to make C look as small as possible as and when the Operational Excellence accountants come along and try to audit what's happened.

Finally, comes the slightly more difficult calculation of the expected net benefits, B, that we expect the project to deliver. B is likely to comprise two possible changes that the new solution might bring about, firstly a likely reduction in operating costs, and secondly, possible increases in sales due to the possibility that the new solution opens up opportunities to grow market share. As with the green area of the Figure 3 graph, our ROI calculation can only assume that the benefits delivered by our project will only last for as long as the time left until the next s-curve pulse. After that pulse has occurred, no matter how good we think our Mode 1 solution is, we have to make the assumption that it will be progressively replaced by whatever comes next. Our solution might slow and delay the inevitable transition a little bit, but we have to assume that, as in the case where we decided to do nothing, there will come a time when we can no longer claim that our solution is still generating new revenue.

Once we've made the best estimate we can of B, we can now simply calculate our expected ROI as the ratio of B/C.

Because we're looking for our calculation to be a leading rather than a lagging indicator, there are a number of things we can do once we have made our first estimates of C, B and the green area on the Figure 3 graph. If the ROI doesn't sound attractive (some companies will start with a target ROI to be achieved), we may choose to not take on the project. Or we might look to see if we can do it cheaper. Or, better yet, we may choose to re-look at the proposed idea we're about to spend our time and money on and explore whether it might be preferable to go back to the drawing-board and see if we can't devise a stronger solution, possibly one that takes us to a Mode 2 opportunity…

ICMM Level 1, Mode 2 Sustaining Innovation

…being a stronger solution, a Mode 2 innovation project offers a greater window of opportunity to exploit the solution that has been developed. The primary assumption we make here is that, because the solution is more protectable and represents a genuine step-change, it will prevail for one full pulse of the industry in addition to the remaining time left of the existing pulse.

Here, for the first time, we need to dig a little deeper into the question of 'sustaining' and 'new' innovation types. In this example, we assume that it is the former. 'Sustaining' here means that our primary motivation is to preserve our existing revenue streams as much as possible. When automotive companies introduce a new Mark of model, for example, their aim is that previous customers of the old model will come back and buy the new one.

A 'new' innovation in our ROI context means that either we are jumping in to a new market or are looking to disrupt our existing market, or – more rarely – both at the same time. 'Disrupting' here is intended to be interpreted per Clayton Christensen's original definition of the word as found in The Innovator's Dilemma (Reference 2).

We'll look at the ROI calculation for that scenario next, but in the meantime, Figure 4 illustrates what it looks like for the 'sustaining' case:

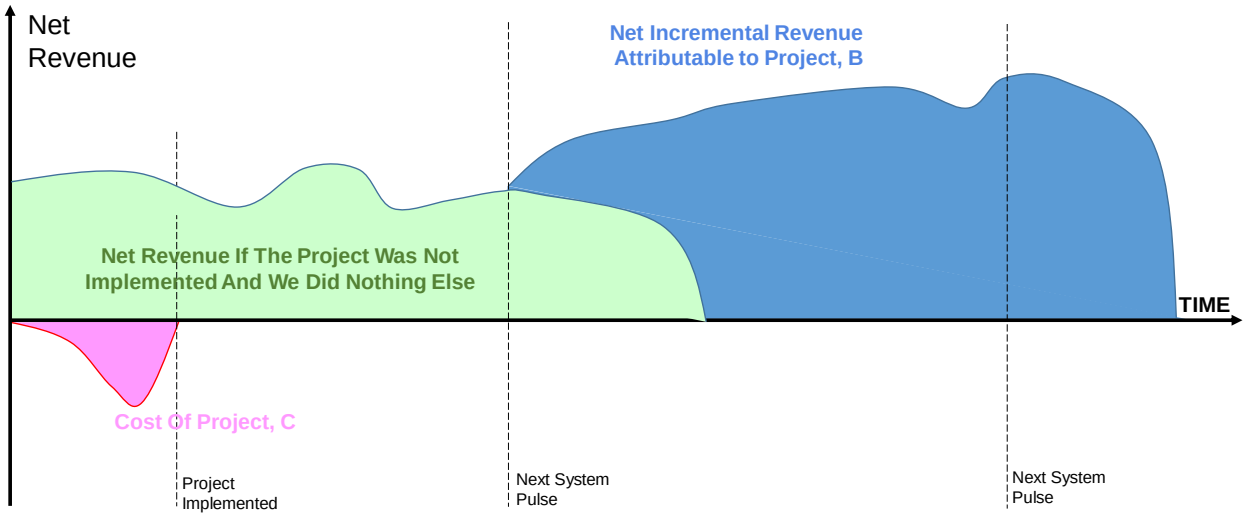

Figure 4: Outline ROI Calculation For ICMM Level 1, Mode 2, Sustaining Innovation

Essentially, the calculation for both the green area 'if we did nothing' and the project cost, C remain the same. The main difference comes with how we calculate the benefits, B. Two key assumptions are present in this blue area on the graph: firstly, that because our solution represents a true step-change, we shouldn't expect to be able to deploy it immediately. Rather, we're going to have to wait until the industry is ready for an s-curve pulse. Failure to take account of this potential deployment lag is a common problem with many innovation teams today, especially those that have developed a strong track record of delivering some very elegant new solutions that the team can't understand why they sit on a shelf not being picked up by production project teams.

The second important assumption is that we should only allow ourselves to accrue net revenue benefits from a Mode 2 solution for the duration of one industry pulse. After that, even, if in reality our solution doesn't get superseded, our calculation assumes that, after the next pulse time arrives, our solution will be progressively phased out.

Figure 4 should also trigger another couple of important thoughts. The blue area, 'B' in Figure 4 will be larger than the equivalent blue area in Figure 3 because we now get to accrue the benefits of a whole industry pulse rather than whatever is the remaining time left til the next pulse in the Mode 1 innovation scenario. This in turn should suggest to project teams that they ought to pay attention to how far in advance of the coming next pulse their project is scheduled. Money spent today is inherently worth more than money spent two years down the line, and if we wish to avoid having our hard work sitting on a technology shelf for several years because we failed to pay attention to industry pulse-rates, more fool us.

ICMM Level 1, Mode 2 'New' Innovation

If our Mode 2 solution is 'new' rather than sustaining, we need to modify the Figure 4 calculation to look more like the graph shown in Figure 5. The key difference between the

two is that whereas a Mode 2 sustaining innovation gets a ‘flying start’ when the industry pulses, when the innovation is ‘new’ we can’t assume large revenues initially. There will be an inevitable s-curve shaped ramp up period during which we have to attract pioneers and ‘early adopters’ to give our solution a try. The blue area in the Figure 5 ‘new’ innovation graph is likely to be smaller than the equivalent area in the ‘sustaining’ innovation graph. Another factor that might inform the innovation team whether it is appropriate for them to play the sustaining or new game… for the large majority of ICMM Level 1 enterprises, unless they seek to innovate with higher Level Capability partners, all of their innovation activities are likely to be sustaining rather than new.

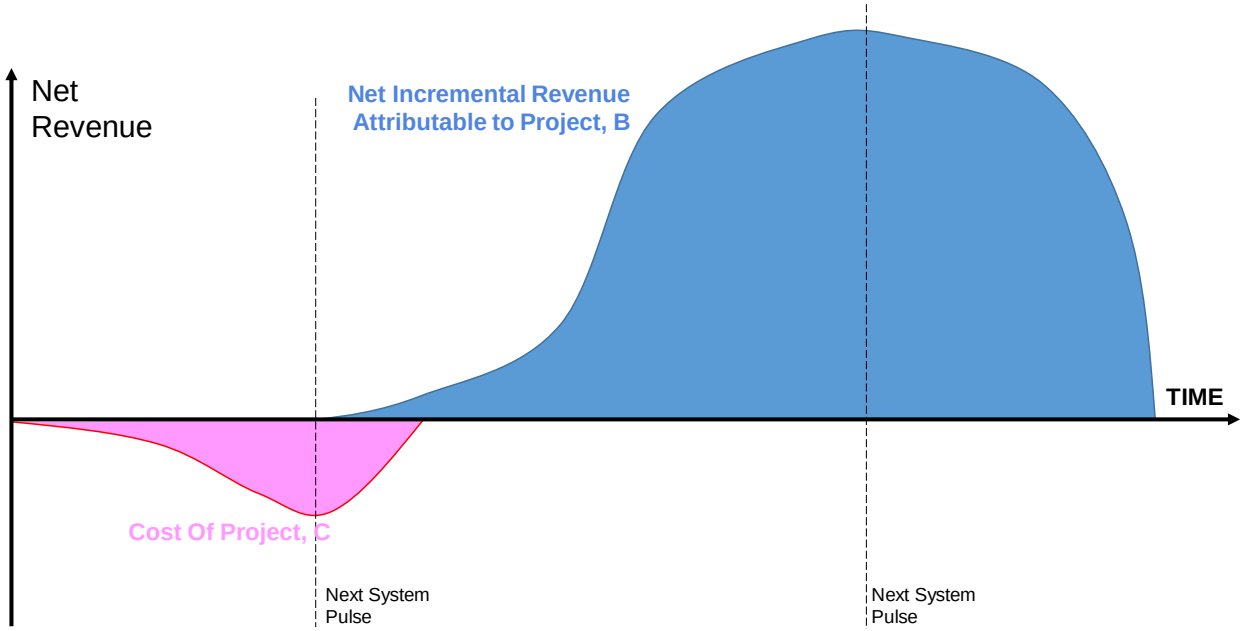

Figure 5: Outline ROI Calculation For ICMM Level 1, Mode 2, ‘New’ Innovation

Mode 3 ‘New’ Innovation

Now, in theory, we could say that Figures 3, 4 and 5 offer up a framework that we can simply build upon for progressively higher Modes of innovation. A Mode 3 innovation, for example, will crudely add a further pulse-worth of exploitation time as shown in Figure 6:

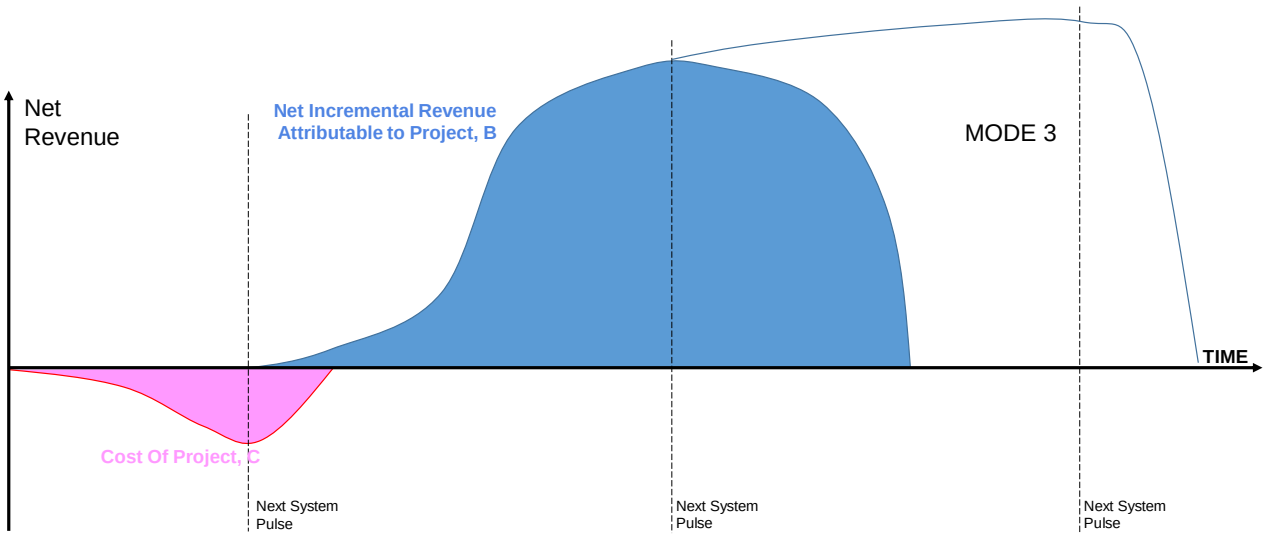

Figure 6: Outline ROI Calculation For Mode 3, ‘New’ Innovation

As we might expect, the reality, when we reach the dizzy heights of Mode 3 innovation are not so simple in reality as this model might suggest. The Figure 6 calculation is still firmly cemented in the world of the ICMM Level 1 enterprise, and by rights, no Level 1 enterprise is going to successfully complete a Mode 3 innovation attempt. In this sense, the simple yet clear heuristic is that innovation success comes from matching the Mode of project type with the corresponding ICMM Level. Level 1 enterprises should only embark on Mode 1 projects; Level 2 enterprises should do Mode 2 projects; etc.

The simple ROI calculations shown so far are about what is needed for Level 1 ICMM enterprises and as such they are able to ignore two very important effects that come into play as soon as we start thinking about taking on Mode 2 or higher innovation projects. Namely,

1) We can no longer sensibly ignore the nested s-curve hierarchy effects. When a Mode 3 pulse occurs, it progressively destroys the value of Mode 1 and 2 solutions. When a Mode 4 pulse occurs it progressively destroys the value of Mode 1, 2 and 3 solutions. And so on. As the Innovation Capability of an enterprise increases the less able it is to legitimately ignore higher Mode pulses and when they happen. As a general rule, above Level 1, a Level 'n' ICMM enterprise needs to take into account the Mode 'n+1' pulse rate when making their ROI calculations.
2) Even more likely when it comes to Mode 3 and higher innovation projects is the fact that the eventual innovation is going to come from a *portfolio of sub-projects*. The particular significance of this segmentation of the 'C' part of the ROI calculation is that any single project manager might be responsible for only one project within a cluster of other projects that can only be said to deliver any meaningful benefit, 'B' when they have all been successfully completed. To take an extreme example, a project manager working in a slow pulse rate industry like mining might be working on one of a range of parallel other innovation-focused projects where the expected pay-off might not be realized for several more decades. How does that project manager demonstrate to their boss that they are contributing positively to the bigger ROI picture?

The first of these issues, essentially says that it is a good idea to build an automated app to take into account all of the nested pulse rates and to manage the complications of the overall ROI calculation and for how long a given Mode of innovation project should have its benefits calculated (funnily enough, we have such an app on the way, by the way!). It offers an order of magnitude greater complication that is relatively to manage through an appropriate spreadsheet calculation. The second issue, on the other hand, opens up a whole new level of complexity to the ROI calculation. How much benefit can we meaningfully attribute to a project that is one of a portfolio of fifty others that all need to deliver if an actual innovation is to be delivered?

This question is one that we can only hope to give an actionable answer to in a tract somewhat longer than this article can sensibly hope to be. If that sounds like a cop-out, that is certainly not the intention. We know how to perform this 'partial project' ROI calculation thanks to all the previous work we've published on the importance of 'managing the unknowns' in the innovation context. Calculating the expected ROI of one of a portfolio of inter-connected and inter-dependent projects involves making as comprehensive a list of all the 'unknowns' that need to be answered within a project (including some kind of estimation as to the contingency we should allow for the 'unknown unknowns'), attributing a value to each of those unknowns and then working out how much it will cost us to answer said unknown. If we answer an unknown worth X and spend X doing it, our effort should be accounted as an ROI of 1. If we manage to spend less than

X answering the unknown, our ROI becomes greater than unity; if we spend more, then we're in the less-than-unity world. Most people in the Operational Excellence world, and almost every accountant and economist we've ever had the pleasure (and frustration) to work with tends not to get the idea of 'managing the unknowns' at all. That's because they don't understand the power of TRIZ/SI to help us to clearly see what the large majority of 'unknowns' in any situation actually are. References 3 and 4 offer up a couple of published examples of how TRIZ can be used to help contribute towards meaningful calculation of innovation ROI when, before we start a project, there are myriad 'unknowns'. No doubt we will publish more examples as this ROI calculation story evolves towards its almost inevitable end point as both an app that is able to hide a lot of the complexities from those that don't want to or need to know them, and a book for those that do need to know them.

Before we finish here, we thought it was important to provide at least the bones of how project leaders in different ICMM Level enterprises need to think about and configure the ROI calculations they need to be able to make to justify to their actions to their sponsors and also, most important of all, be able to build scenario models that enable them to explore different project options and decide what is perhaps the ultimate question, 'if I've got a budget of Z, what's the best way for me to spend it in order to secure the highest possible ROI for my organisation?'

Table 2, therefore, provides an indication of the additional levels of sophistication we recommend are added to the 'C' and 'B' aspects of the ROI calculation as the ICMM Level of the enterprise evolves. A Level 4 Capability enterprise should do all the Level 1, 2 and 3 stuff and add to their calculations all the new stuff suggested in the table for Level 4 organisations. A Level 5 Capability enterprise (of which there is realistically only two entities on the planet that have attained) should do all the Level 1, 2, 3 and 4 stuff and add what's indicated in the Level 5 parts of the Table.

ICMM Level	'C' Cost Calculation	'B' Benefits Calculation
1	Labour costs, Hardware procurement costs, Test costs, External costs	Internal costs saved as a result of implementing the project, Increases in revenue generated as a result of the project
2	Learning that tells us not to travel further along a certain direction, Savings associated with 'not re-inventing the wheel' (e.g. exploiting TRIZ/SI)	Extension of life of any existing infrastructure that can be preserved following an innovation,
3	Costs of answering the portfolio of 'unknowns', Tangible 'lost-opportunity' costs, Savings attributable to not over-complicating a solution design (the typical s-curve shows that systems become more complicated before they become less complicated again – a Level 3 innovator will be capable of doing much to mitigate the over-complication), Net gain of exploiting external	Savings attributable to stopping of redundant activities at lower Modes in the S-curve hierarchy Savings attributable to learnings that tell us to stop or re-configure a project or project portfolio Increased revenues attributable to blocking a competitor from launching or exploiting solutions that impede our markets Increases in revenue attributable to forcing competitors to travel along inferior trajectories, Revenue synergies resulting from cooperation with third-party innovation teams

	‘R&D’ project support funds, Risk-sharing savings of cooperating with third party researchers	
4	Reduction in costs attributable to stopping doing redundant jobs, Removal of silos Removal of the dominance of ‘domain expertise’ Reduction in cost due to ‘sense of progress’ and confidence of team, Increase internal staff engagement, SLT trust, Intangible lost-opportunity costs	Inclusion of ‘intangibles’ such as Increased confidence (from customers and external stakeholders), ‘cool’ness of solution, Increased external engagement, Increased pride, dignity, trust in management, etc from the outside world, Intangible impacts of elimination of tasks and roles from past lower Mode innovations, (elements described in Reference 5)
5	Cost/value ratio calculation to informs leaders which industries and domains offer the best ‘bang-per-buck’, Savings due to ‘self-organising’, empowered innovation teams	Benefits of killing projects early, ‘unlearning’ costs and benefits, Third-party synergy effects, ‘Societal respect’ effects

Table 2: Calculation Of ‘B’ and ‘C’ Elements of ROI At Different ICMM Levels.

Enough already.
And, breathe.

References

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