
Calculating “Enterprise Technical Debt”

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Version: 0.02

Date: 19 April 2009.

Abstract

This paper proposes a simple mechanism for calculating the Money Future Value of Enterprise Technical Debt (ETD) showing a simple worked example, so that the business people can understand the financial implications of their Tactical versus Strategic technical architectural decisions.

Background

The metaphor of “Technical Debt” was first used by Ward Cunningham [1] to describe software development implementation choices for an Application in an enterprise, which specifically addresses bespoke software development implementation strategies. The concept was further elaborated upon as Enterprise Debt by Kevin Smith [2] using the identical metaphor at the higher level of enterprise Strategic vs. Tactical consideration of implementing anything technical into the enterprise, packaged systems, even hardware, connectivity and communication systems. I prefer to call it [Enterprise Technical Debt](#) (ETD), as it is Technical in nature, and not quite the same as normal enterprise debt which is very accurate and contractually binding.

Traditionally many senior business stakeholders in organisations have not taken an interest in Technology and have largely delegated the technical details to the IT Department to resolve. This assumption is dependent upon the maturity of the organisations however.

So when IT Departments request extra funding to motivate for strategic technology direction changes, it becomes difficult to cost justify the reason for these technical decisions in terms the business would relate to, because the direct reasons and justifications are very difficult to translate into money terms. E.g. “You will be in a position to re-use technology and therefore be more agile in future.” cannot be easily translated into definite money terms like “re-use and agility will save you £2mill in two years”. This is challenging to prove.

This challenge becomes even more difficult in a project centric environment where strategic change is imposed upon individual projects. Any strategic upgrade cost should really be shared by multiple projects that each benefit from it, but instead the cost gets unfairly lumbered onto the first project that requires the strategic technology.

For that individual project, a move to get the enterprise into a strategic direction puts an unrealistic overhead on the project to take longer and appear to be far more costly than the shorter more tactical solution. Why? One reason is that often a small simple change project might have to carry the burden of a high-cost new technology. An extreme but valid example might be; To develop a small simple web app might need a whole new Strategic Enterprise Portal with servers installed, so when the business ask IT to do £10k worth of work they want to charge £1mill!

In general, the reality (based on experience) is the business opt for the quickest and often cheapest most direct option to deliver what they need, and do not particularly care about the technical consequences and risks for the bigger enterprise picture. Frankly IT also does not give the business the full picture so that that can see the implications of their decision. Obviously this is a generalization but happens more often than not.

Introduction

This paper proposes a reasonably simple estimation mechanism to translate the technical and other cost items into both a Money and Time value that the Business can relate to and compare for any project. This

helps make technical issues visible to and accountable by business people who are not technical.

Rationale

This approach indirectly helps convey the hidden cost of projects not taking technical strategic choices immediately, by using a concept called “Enterprise Technical Debt” (ETD). The ETD calculation looks at not only solving the Projects immediate delivery goals and costs, but also the enterprise technical debt incurred by any project on the enterprise overall. ETD is calculated by accumulating the **debt** in taking a Tactical dispensation approach over implementing the Strategic solution immediately.

It is quite acceptable to take one of the Tactical alternative solutions for various good reasons, provided the business decision is made in the “reasonably” comparative knowledge of the future likely full costs to move back to the Strategic direction. In some cases might well be the same cost again plus interest on the capital cost over the elapsed time.

The ETD money and time value will always be an estimate and never be entirely accurate, but will be accurate enough for the business to make the right decision. The estimate should be within a realistic order of magnitude of the original cost. It should not take more than a day to estimate.

Our example Scenarios

Without getting into any technical product or detailed specifics, look at the following hypothetical example;

- System X already exists and is running live.
- System X is already using the strategic product. (Another scenario could be where it is not strategic)
- A Project ABC is implemented to upgrade System X to enhance it with various requirements.
- The requirements are to obtain input from some source E,
- To do some complex processing including certain user interaction,
- Then send output to system F.

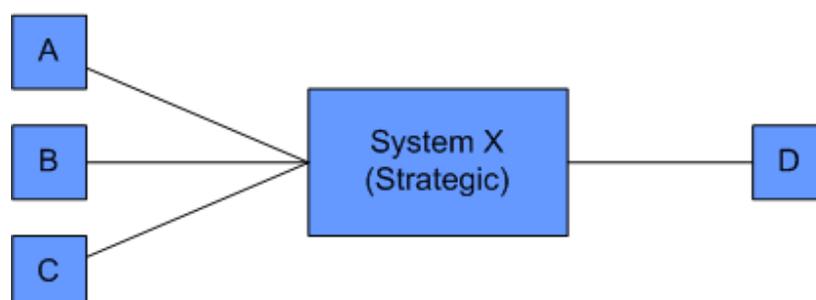
After some analysis we decide there are three main alternative solution scenarios plus the current system.

The Current System context – an implemented strategic solution

Below is a simple diagram of enterprise system situation before we do any work to change or upgrade the system. We have assumed in this example that the current (blue coloured) implementation of the system is already the strategic option. It takes information from A, B and C and sends information to D.

Strategic vs. Tactical
- Current System (already Strategic)

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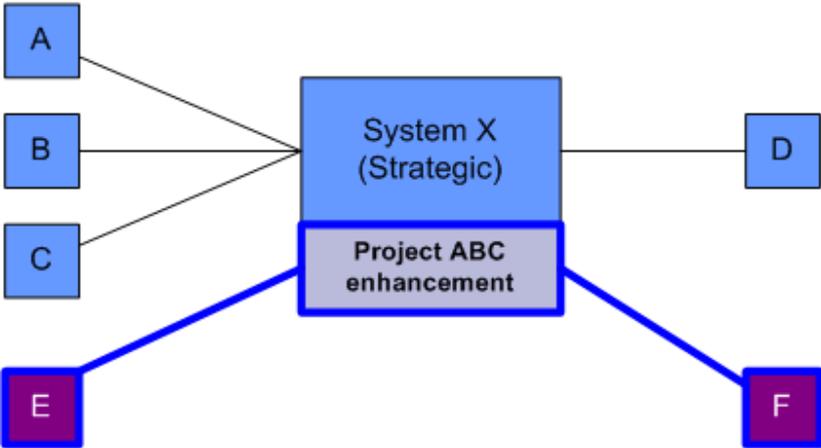
Scenario 1 – Extend the existing strategic system

The first scenario is the ideal technical solution. That is to extend current strategic system by adding extra modules with all the necessary internal required functionality. Then to process the new E input and send it to F as required. This has quite a lot of bespoke work and is therefore expensive.

Cost estimate is £2Mill. Time estimate is 12 months.

Strategic vs. Tactical
- Option 1 - Enhance Current System

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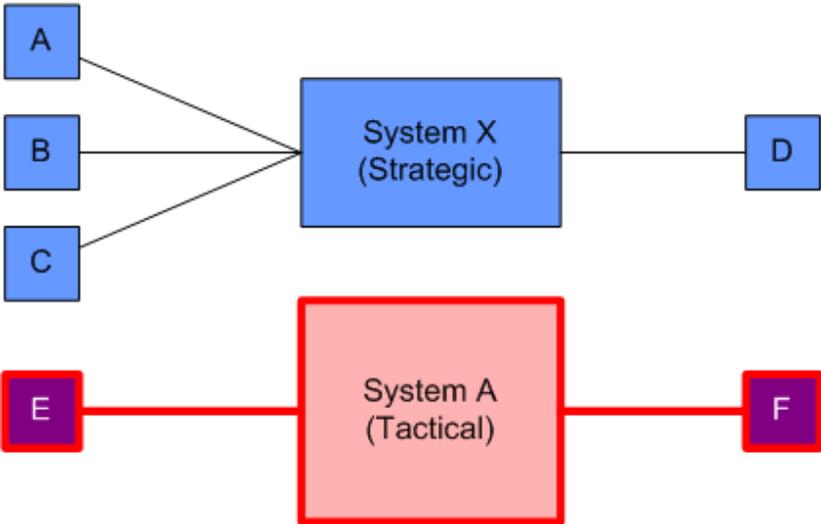
Scenario 2 – Implement a Tactical system from vendor A

The second scenario is to buy and implement a stand-alone (Red coloured) system from vendor A and use as is, off the shelf. Some minor changes will allow for input from E and output to F. This has minimal bespoke work and is therefore quicker and cheaper all round.

Cost estimate is: £1.68M. Time estimate is 6 months.

Strategic vs. Tactical
- Option 2 - Purchase System A (Tactical)

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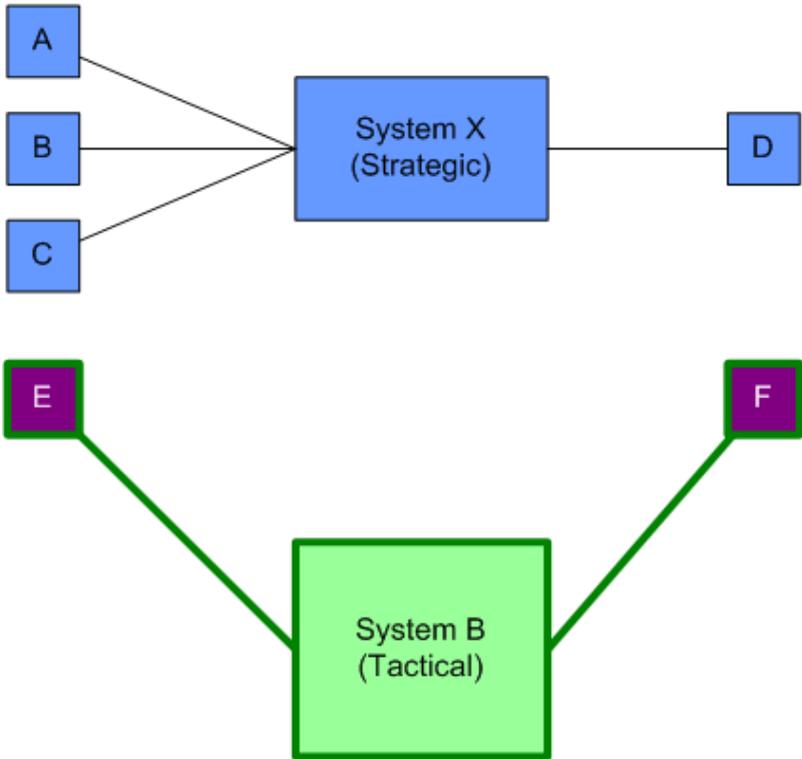
Scenario 3 – Implement a Tactical system from vendor B

The third scenario is to buy and implement a stand-alone (Green coloured) system from vendor B and use mostly as is, off the shelf, but do some configuration and bespoke work. Some minor changes will allow for input from E and output to F.

Cost is £1.31M. Time is 12 months.

Strategic vs. Tactical
 - Option 3 - Purchase System B (Tactical)

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Typical Calculation Method

Each scenario is evaluated for what it would cost the Project ABC in **money** terms and the period of **time** it will take to deliver the system. This is given to the Project board to approve, with all the usual other information such as risks, etc. Let us also assume the business strategy is solved by all these alternatives equally, so there is no business strategic weighting in this calculation, only technical weighting.

So given the above example we would see that we have these factors:

Alternative	Time to Deliver in months	Cost to Deliver	The Business Call
Scenario 1	12	£2 000 000	Expensive - Strategic
Scenario 2	6	£1 684 000	Quickest - Tactical
Scenario 3	12	£1 310 000	Cheapest – Tactical

Usually, depending on the each company’s situation; the business will take the cheapest and quickest option.

In this case they would probably select scenario 2, if **Time** was the issue and select scenario 3 if **Money** was the issue. Assuming the time and money weightings were equal, then the business would probably on balance go for option 2 as it is quickest and of the cost options still cheaper than the Strategic scenario. Probably the least likely to get selected would be scenario 1 as it is the most expensive and takes longer.

ETD Calculation method added

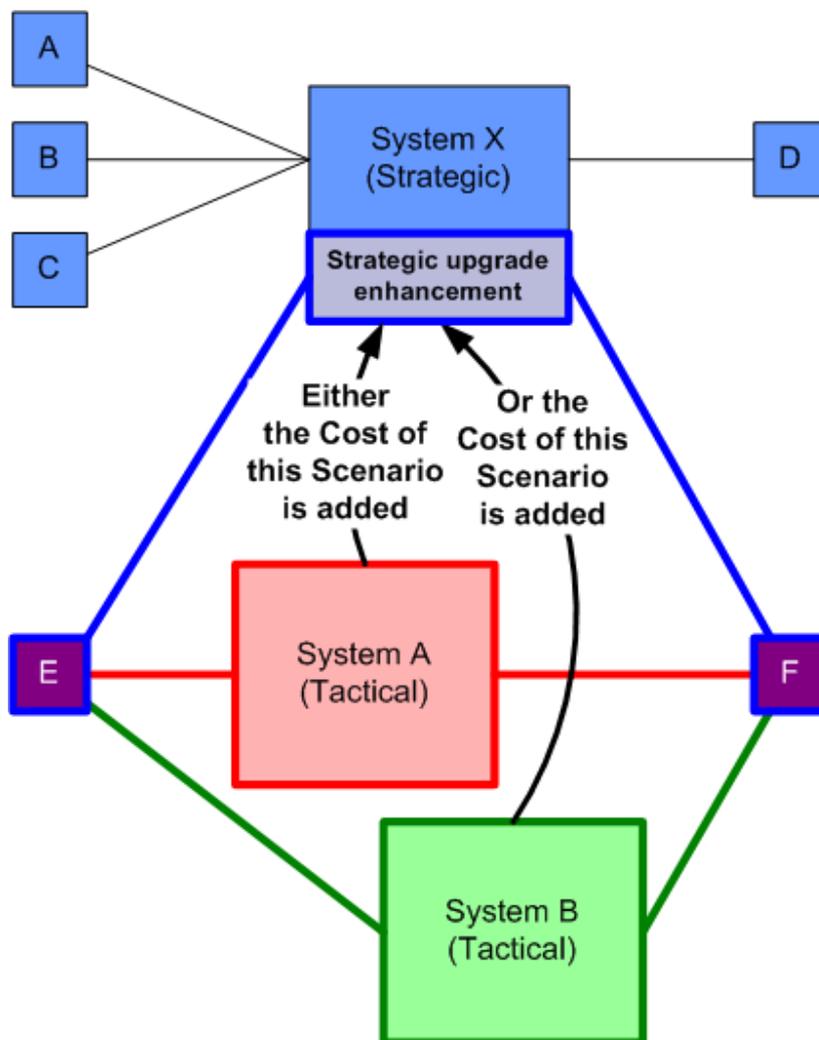
Looking at the situation holistically, we would calculate two sets of estimate factors:

- **Initial Implementation** - The alternative Costs to implement the initial Solution set. A Time and Money cost for each option.
- **Estimates for Tactical to Strategic work in months to come** - The Cost of the Debt incurred by each Tactical scenario converted into a Future Value, (assuming a time when the Debt will most likely be repaid by, meaning the likely time the Tactical solution will be replaced by the Strategic solution.)

Thus, up-front we would give the business the implications of their decision, with which they could make a proper and informed judgment. Even if only 75% accurate it is still a significant improvement in making an informed decision.

Strategic vs. Tactical
- Later convert from Tactical to Strategic

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This gives the business a real cost and time basis upon which to measure and appreciate the impact of these technical decision differences. ETD takes Total Cost of Ownership [3] (TCO) to the next level, because it plots not only the cost of ownership for this Tactical scenario, it factors in the cost of alignment to the Strategy as well.

For each scenario we take the above normal calculation and then add onto it the effort to move from the **Tactical solution** implemented to the **Strategic direction** some n months later (we've assumed 2 years later for this example), with the interest being calculated to show the Future Value of the current Present value at a conservative rate of 5% pa.

For simplicity sake for this example we have also assumed that to move from Scenario 2 and Scenario 3 to the full Strategic solution will only take 8 months and cost the same for both.

The calculation simply uses Future Value [4]

- ≈ -FV(Interest Rate %, No of payment periods, [Monthly payment], Present Value of Capital)
- ≈ -FV(5%/12,24,0,1360000)

Alternative	Time to Deliver Strategic Upgrade Solution 2 years later in months	Capital amount to move to Strategic option Now	Enterprise Interest incurred on the 24 months waiting	Future Value after 24 months
Scenario 1	0	0	0	0
Scenario 2	8	£1,360,000	£142,720	£1,502,720
Scenario 3	8	£1,360,000	£142,720	£1,502,720

So given the above example we would see that we have these factors:

Alternative	Time to Deliver both in months	Cost to Deliver now	Cost now with ETD added to deliver current (and future strategic upgrade)	The Business Call
Scenario 1	12+0+0	£2 000 000	£2,000,000	Cheapest - Strategic
Scenario 2	6+24+8	£1 684 000	£3,186,720	Most expensive
Scenario 3	12+24+8	£1 310 000	£2,812,720	Next most expensive

So given this new information, the business can now still choose to implement scenario 2 if time and speed is of the essence, but if money is the issue, then scenario 1 will win outright, for both cost and the extra 8 months time saved two years later moving to the strategic alternative.

Suddenly scenario 2 which initially looked by far the best option now looks by far the worst option.

Balance sheet measurement

Just as real money debt, ETD also has an incremental cumulative interest, which grows the longer you leave the initial Tactical solution dispensation (unpaid-off capital) in place. The sum of all projects ETD should be accumulated in one account for as long as each dispensation is not resolved. The reverse is of course also true, the sooner you align each dispensation to the strategy, and pay off the ETD, the cheaper the overall collective cost to the enterprise.

Ideally this should be measured on the balance sheet in financial terms, just like normal monetary Enterprise Debt loans are measured currently. Even if these figures are not accurate, they can be estimated in broad brush-strokes, relative to within say 5% of the estimation, which will make visible, in financial terms, the deviation from the strategy and show it's cumulative effect of improvement or deterioration over time.

ETD accumulation over time means a deterioration of your Technology estate alignment strategically. Measured by the resulting interest accrued by not paying off the capital; i.e. Not resolving the alignment of technologies to the strategic direction. This means projects like the example above that were supposed to be "repaid" within two years, if not done, would continue accumulating interest and growing the ETD account.

ETD reduction over time means an improvement of your technology estate alignment strategically. Measured by the reduction of the total Capital and Interest payments. This means that if projects like the example one were turned strategic early that it would “pay off” the debt early saving interest and capital, in the ETD account.

Conclusion

Often the business retort to this type of information is “you can’t prove this will happen 100% accurately so why should I buy-into this at all?”

Well the answer to that is you have to start somewhere. Until the enterprise begins to measure the Enterprise Technical Debt it will remain hidden and invisible and companies will never realize how poor their strategic alignment compliance is.

These enterprises will simply become ever more inefficient and ineffective, become slower and slower at keeping up with the ever quickening pace of business and ultimately drown in complexity.

References

- [1] **Technical Debt**: http://en.wikipedia.org/wiki/Technical_debt
- [2] **Kevin Smith**, PragmaticEA.com - <http://www.pragmaticea.com/docs/peaf-comms-ea-3enterprise-debt.pdf>
- [3] **Total Cost of Ownership** - http://en.wikipedia.org/wiki/Total_cost_of_ownership
- [4] **Future Value** - http://en.wikipedia.org/wiki/Future_value

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