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Conquering Complexity

UNIVERSITY OF
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Executive Summary

- There is a correlation between project complexity and project performance and project performance is highly variable across organisation

- Different organisations exhibit different complexity thresholds, after which performance rapidly drops away. This is called the 'Complexity Cliff'

- Organisations need to understand which of their projects will take them beyond their complexity cliff

Traditional Project Management approaches will only get you so far. After that there is a completely different way of thinking and working.

Background:

In 2011 The Helmsman Institute and the University of Technology Sydney initiated a research initiative aimed at understanding the key drivers of success and failure of complex projects. Over the next 3 years Helmsman captured performance and complexity data from thousands of Australian Projects. This foundational research was completed in 2013 and the data is being investigated. With support from Government and Industry the insights are now becoming clear and the Helmsman Institute will continue to provide updates on a regular basis.

The 3Yr $1.2 million study partially funded by the Australian Research Council and a number of prominent Australian organisations looked at the relative complexity and performance of thousands of projects across multiple industries.

The research revealed that surprisingly, 'size' and 'cost' are not the key drivers of success or failure. Rather it's the mature application of several sophisticated approaches and behaviours usually considered part of other fields and specialities and outside that of traditional Project Management discipline areas.

The complexity cliff

The recently completed research study into Project Complexity by UTS and the Helmsman Institute has revealed that; **traditional Project Management approaches applied to Complex Initiatives result in a significant performance drop-off and often project failure.**

Project Performance is highly variable across industries and organisations.

When we consolidate information across industries and across organisations there appears to be no significant correlation between project complexity and project performance.

Many complex projects succeed and many simple ones fail.

Cross Industry View
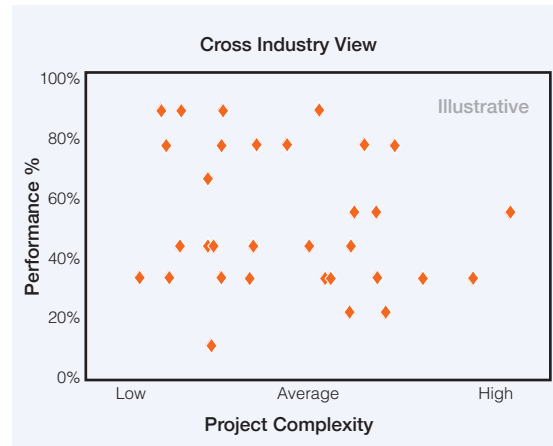
However this changes when the data for individual organisations are analysed.

Every organisation in our research shows an exponential reduction in performance above a complexity threshold. Beyond a certain tipping point a company's risk and control systems begin to fail.

Once complexity reaches a tipping point, project performance drops off rapidly.

A Single Organisation View
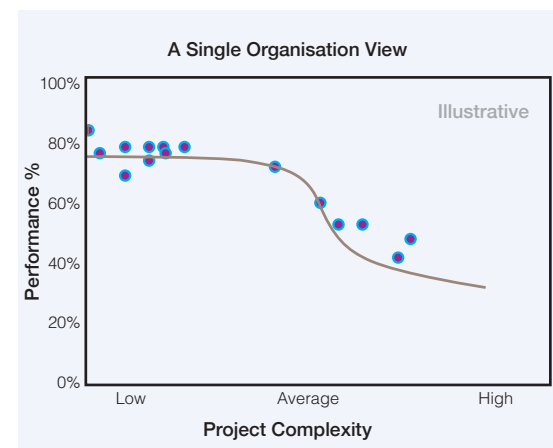
The tipping point threshold appears to be different from organisation to organisation.

When we compare project success vs complexity across multiple organisations it becomes evident that some organisations are better at managing projects than others and complexity is the primary performance driver.

Organisations that are able to better manage complexity have better project performance.

A Multi Organisation View
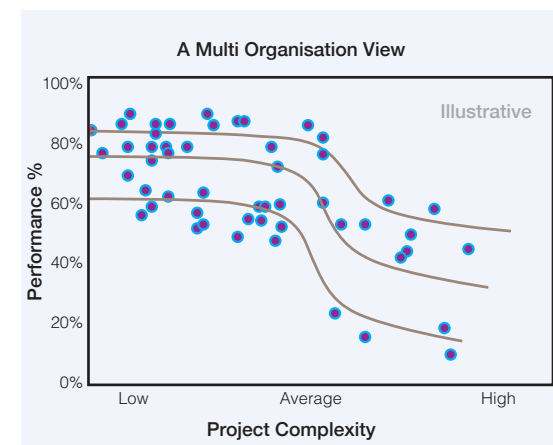
What is complexity?

Is complexity is in the eye of the beholder?

Significant time and effort has been dedicated over the years to understand Project Complexity.

The problem Australian practitioners are experiencing with complexity theory is that

A project that is defined as 'complex' does not necessarily mean that it is 'difficult' to deliver

whilst a project may be perceived and defined 'Standard' or 'Simple' this in itself is inadequate to describe the practices that need to be put in place to ensure that the initiative is successful. Despite good project management skills and relatively simple projects the failure rate is still high.

Conversely, a project that is defined as 'complex' does not necessarily mean that it is 'difficult' to deliver. Very often the definition of

By making the distinction between a 'Measure' and an 'Experience', we also make the important distinction between 'Complexity' and 'Difficulty'

complexity is in the eye of the beholder and this seems to differ from organisation to organisation, in fact industry to industry. Qualified and experienced project managers working on relatively simple projects are consistently

unsuccessful in some companies, while other organisations seem to be able to turn everything they touch into gold.

Russell Standish of the University of NSW describes this phenomenon as context dependency;

"It is argued that an inherent property of complexity and related topics is context dependent. However Scientists have a tendency towards discomfort with context dependence which smacks of subjectivity and is perhaps the reason why little agreement has been found on the meaning of this term" (Russell K Standish, UNSW 2001).

Claus Emmeche, Associate Professor at the Niels Bohr Institute, University of Copenhagen provides a possible escape route out of this dilemma by stating pragmatically that;

"Complexity, even though understood as a real aspect of the world, when perceived and comprehended by a local observer will always be relative to his or her descriptive vocabulary. (Emmeche 1997, Philosophica vol. 59)

The cybernetics pioneer W. Ross Ashby however held a more radical view in rejecting the attempt to define an absolute or intrinsic measure of complexity. Ashby states that "a system's complexity is purely relative to a given observer. The acceptance of complexity as something in the eye of the beholder is....the only workable way of measuring complexity" (Ashby 1973; cf. Casti 1986, p.169).

However, Helmsman have a different perspective

Helmsman propose that the observers 'experience' of complexity is subjective based on their context and their capability to manage it. However, if the contextual elements are removed then 'Complexity' becomes an objective, quantitative measure.

What's the difference between 'complexity' and 'difficulty'?

One of the core outcomes of this research work is making the distinction between 'Complexity' and 'Difficulty'. These are two different terms are often been used synonymously and need to be distinguished for the purposes of this paper.

The fundamental difference between 'Complexity' and 'Difficulty' is that 'Complexity' can be defined independently from its environment and is therefore assessed as an inherent and objective measure.

Complexity is an objective 'Measure'

Difficulty is a subjective 'Experience'

'Difficulty' on the other hand is an 'Experience' influenced by the environment and is therefore contextual and subjective.

'Complexity' is a leading indicator to 'Difficulty'. A project that is inherently complex has a greater likelihood of failing than a project that is inherently simple. However, a project that is defined as 'complex' doesn't automatically

'Complexity' is a leading indicator to 'Difficulty'

mean that it's difficult to deliver. Conversely, 'simple' projects are often known to fail.

Understanding complexity involves the consideration of contextual and environmental issues and how they specifically make complex projects 'difficult' to deliver. However

because the reasons that make projects 'difficult' to deliver differs from Project to Project, Company to Company and Industry to Industry we must have a measure that can be benchmarked from project to project and across companies, industries and countries.

Thought leadership requires that research and educational institutions continue to examine and unravel 'Complexity' if we are to understand what drives it and how to manage or counter it.

In Australia, the focus on project complexity, the desire to define it, understand it, bottle it and 'conquer it' has opened up a world of insight and a new and completely different way of thinking and working.

Helmsman have begun to achieved through the analysis and benchmarking of projects, the application of its academic research work with Universities and Helmsman's involvement in some of the most complex projects in Australia both in the Public and Private Sectors.

The Helmsman complexity scale is a comparative and objective measure of complexity between projects across any domain and was developed in conjunction with Government, Industry and Academia. Using the Helmsman complexity benchmark, 2 different organisations and projects may result in the same complexity score but experience very different levels of difficulty depending on their unique capabilities and controls of each organisation.

With the direct support University of Technology the Helmsman complexity scale was used as the basis of a $1.2m Australian Research Council Government Grant to investigate the factors that make projects successful.

What drives complexity?

There are 5 fields of knowledge that combine to make projects complex.

1) Political Context

2) Sociology

3) Ambiguity

4) Technicality

5) Project Management

The combination of these elements and the specific factors that comprise them have a multiplying effect on the complexity score and subsequently the potential difficulty to execute.

Political Context:

Looks at the complexity of the leadership and political environment faced by the project. That is, how many key stakeholder communities need to be managed for project success, what are their expectations and how aligned the stakeholder leadership is.

Sociology:

Looks at how deep the impact will be on the change recipients, how large and diverse the recipient group is and how difficult it will be to have them understand and deal with the issues that are facing them in relation to their existing culture and values.

Ambiguity:

Looks at the amount of uncertainty inherent in the project and the extent to which this uncertainty needs to be clarified and defined. Uncertainty can exist in defining the problem and determining the direction; the approach and method needed to execute the project as well as the design requirements and execution costs.

Technicality:

Looks at the intricacy required of the solution. This includes the maturity of technical development, the underlying complexity of the technology, the number of subsystems, technical disciplines required to work together as well as the integration challenges.

Project Management:

Looks at the delivery methods that are required to execute the project. Areas evaluated include contract complexity, risk management, schedule challenge, project structure, external project interdependencies as well as the experience of the project team.

Conquering complexity

Currently Project Management bodies of knowledge, competency standards and certification systems are owned and administered by multiple discrete project management associations and accreditation bodies, which causes confusion in industry and dilutes the maturity of a relatively young profession.* (Hiroshi Tanaka, 2003)

There are technical bodies of knowledge such as planning, scheduling and resourcing,

So now organisations are faced with a decision. 'Reduce Complexity'…..or 'Conquer Complexity'

professional areas of expertise such as business analysis, project management and change management and management capabilities such as benefits realisation, strategy translation and portfolio prioritisation. All of these 'bodies of knowledge' exist within the Project Management 'field of knowledge'. However none of them individually or collectively are able to comprehensively describe complexity.

Ongoing work in Australia by the Helmsman Institute, aimed at understanding and 'conquering complexity' is ongoing and as yet incomplete, however to date an evolving framework has emerged. The framework has been tested across a number of industries and projects of varying complexity and has proven to be valuable and robust.

If you want to conquer complexity there are 3 drivers, only one of which is **Complexity** itself. The other 2 drivers are **Competency** and **Controls**.

The combination and interaction between these 3 drivers determine project difficulty.

It is essential that organisations evaluate and understand the complexity of the projects they are about to take on.

However, you can't always conquer complexity from within complexity.

The best you can do with complexity alone…. is change it. That is, either change the problem definition or approach in such a way that complexity is reduced. This is good practice.

But at some stage it will come to a point where complexity can no longer be reduced without stripping benefits.
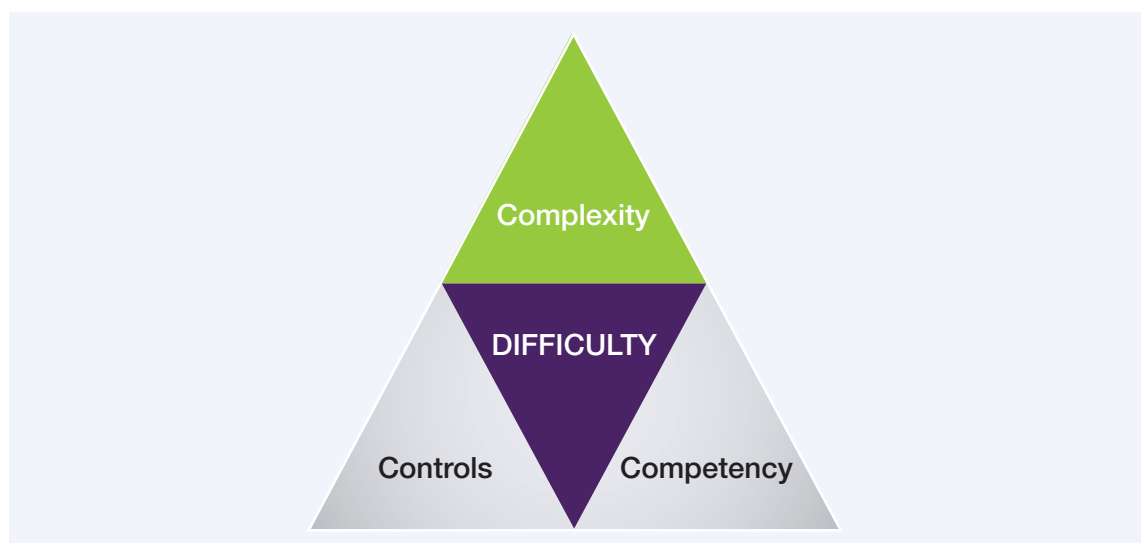
How to conquer complexity and decrease project difficulty

The interrelationship between these 3 drivers can be demonstrated in figure 4. This 'Radar Spectrum' depiction of difficulty demonstrates the required balance required across **Complexity, Competency** and **Control.**

If the Complexity of your Project is HIGH…

Complexity: Decreasing Complexity Decreases Difficulty

Competency: Increasing Competency Levels Decreases Difficulty

Control: Increasing Controls Maturity Decreases Difficulty

Whilst this 'area under the graph' depiction of difficulty is an oversimplified narrative it does provide an effective visual representation of the concept behind the Helmsman Framework and the interrelationship between the 3 drivers of project difficulty.

In reality, the value in the model is in being able to identify with reasonable accuracy which aspects of Complexity, Competency or Control which, if not addressed will lead to project failure. To date, the framework has been tested across a number of industries and projects of varying complexity and has proven to be valuable and robust.

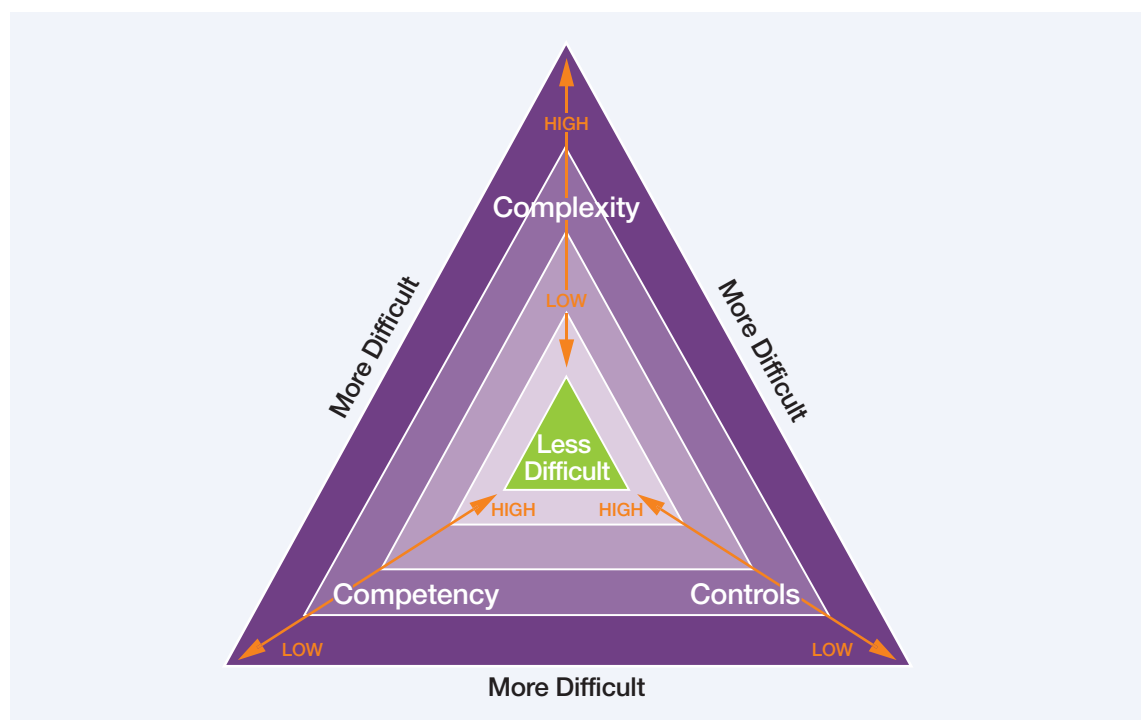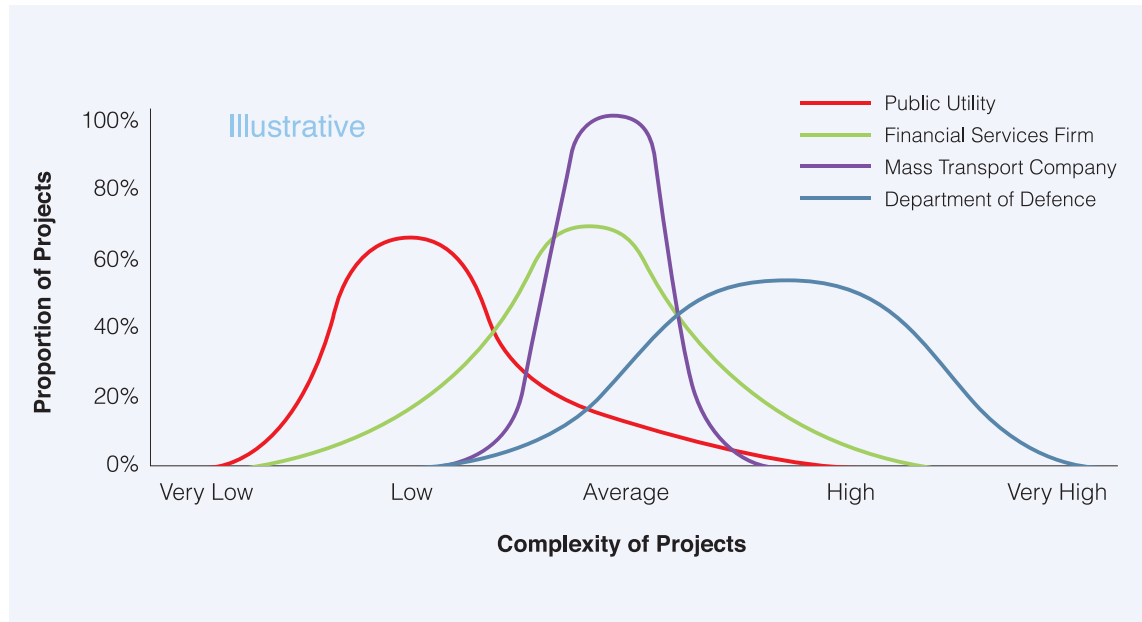**If the complexity of your Project is High, Improve Competency and Controls to 'Conquer Complexity'**

Figure 4. Radar spectrum – Interrealationship between the three drivers of project difficulty

Improving performance

Proportion of Projects (y-axis: 0%, 20%, 40%, 60%, 80%, 100%)

Illustrative

Legend:
- Public Utility
- Financial Services Firm
- Mass Transport Company
- Department of Defence

x-axis: **Complexity of Projects** (Very Low, Low, Average, High, Very High)

Different industries on average tend to reflect different levels of complexity reflecting their business model and execution capability.

However, at any time, any organisation is likely to be grappling with initiatives well above their industry average.

How do your most complex projects compare?

Major projects and programmes of work represent up to 25% of Australia's GDP**. For most organisations they are the key to creating competitive advantage or are central to staying in business which means that are too important to fail.

However, research has consistently found that in Australia, accounting for all levels of complexity and organisational capability, on average >50% of projects underperform.

The Helmsman framework provides insight into the reasons why projects consistently fail in some organisations and why other organisations consistently have superior performance.

Actions to improve performance fall into 2 categories.

1. If your organisation is *below par*, get the basics right

In our research, participating organisations that had a lower than average performance had not effectively implemented basic project management systems and governance approaches. This was in stark contrast to other better performing organisations had invested in in the establishment and embedding of industry standard approaches.

These standards and capabilities can be obtained from PMI, Prince II, AIPM and other industry accepted models and frameworks.

The Project Management Systems to evaluate that can make the biggest difference are:

- Benefits Measurement
- Risk Management
- Sponsorship
- Governance
- Scheduling
- User Engagement & Acceptance
- Requirements Elicitation
- Vendor Management
- Resource Allocation
- Prioritisation

2. If your organisation is *at par*, understand your Complexity Cliff

In our research, participating organisations that have relatively good project performance consistently do well when project complexity is low. Failures and substandard performances generally occurred on the more complex initiatives and programs.

When we looked closer at this phenomenon it became evident to us that lack of performance wasn't due to lack of 'Project Management' capability but rather because these organisations didn't understand or recognise which projects were beyond their 'Complexity Cliff'.

This was true not just for the point of understanding general complexity (high vs low) but more importantly, these organisations were unable to adjust and improve their delivery capabilities in the appropriate areas because they didn't know which complexity drivers to fortify against.

This was true not just for the point of understanding general complexity (high vs low) but more importantly, these organisations were unable to adjust and improve their delivery capabilities in the appropriate areas because they didn't know which complexity drivers to fortify against.

Of 5 fields of knowledge that combine to make projects complex 'Ambiguity' featured most prominently as the complexity driver most likely to cause project failure.

Getting Clear on Ambiguity

On average poor performing projects had 'Ambiguity' complexity scores 25-50% higher than well performing projects. There was also a consistent shortfall in the organisational controls required to manage projects with high 'Ambiguity' complexity.

Implementing a disciplined approach to Ambiguity Management tends to fall outside the standard Project Management field of knowledge, particularly when it needs to be applied to ambiguous systems and situations.

Helmsman believe that Managing Ambiguity is the next significant frontier of Complex Project Management. We will elaborate further on this as the topic of our next report.

What's Important

1. **You need to recognise and acknowledge up-front if you have a complex problem or initiative.** This can be difficult because it might not be formally defined as a project, and if it is it is, complexity is often unrelated to cost and size. However, more often than not it is 'important'.

2. **You need to identify and understand the characteristics of the problem or initiative and which aspects pose the greatest risk.**

3. **You need to take inventory of your current capability (Competencies and Controls) and you need to be confident that it is sufficient to address those specific risk areas you have identified.**

Summary and next steps

Over the last 3 years Helmsman has been working in with the Federal Government, Industry, Defence and Academia to build on its 10 years of complex project experience to develop a research approach that will enable organisations to understand the major factors that cause Projects to be difficult in Australia. Consequently the intention of this initiative is to be able to identify, articulate and implement the organisational capabilities and practices that need to be in place to predict and avoid Major Project Blowouts

Research participants have included a number of leading Australian organisations in industries that conduct large projects, including Financial Services, Telecommunications, Energy & Mining, Construction, Defence and Government, including participation from the Department of the Prime Minister and Cabinet.

The research was led by Helmsman and the University of Technology Sydney, most of the research costs were covered by an Australian Research Council (ARC) Grant provided by the Federal Government, but in kind and financial contributions from industry were required to obtain the grant funding.

The outcome of this research will provide definitive approach to corporate governance, incorporating a set of implementable practices to predict and reduce Project Difficulty in order to avoid major Project Blowouts.

Insights and implementation

Now that this research project has been completed and the data has been collated there is a requirement to apply the findings to real-world situations.

Moving forward on this research baseline Helmsman will be undertaking 2 core actions to drive insights and pragmatic implementation of the findings:

1. Insights - Research Whitepapers and Case studies

As we apply the findings of this research to real-world situations, Helmsman will capture and articulate the results and publish regular insights such as this document.

2. Implementation - Industry Collaboration

Helmsman, in conjunction with major corporations and industry groups have already begun looking more deeply into specific industry sector project models with the intent of improving them and embedding a completely different way of thinking and working required for the success of complex projects. This is a formal learning and knowledge sharing exercise for all parties.

Helmsman would like to hear from you.

If you are interested in learning more about how to pragmatically implement these research findings, or if you are interesting in participating in Best Practice Industry visits please contact:

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The Helmsman Institute carries out leading edge research into complex project management, in partnership with partnership with universities, government and industry. Through identifying precisely what makes major projects and programs succeed or fail, we develop invaluable insights, tools and services that are applicable worldwide.

* *As described in 'The Changing Landscape of Project Management' (Hiroshi Tanaka, Global Symposium in New Delhi, Dec 2003)*

** *Extrapolated across ecomony based on review of capital project expenditure from 1999-2008 (Mining, Energy, Defence, State & Federal Govt & Major Finance Sector Projects)*