



**CONSTRUCTING
EXCELLENCE**
IN NEW ZEALAND

Constructing Great New Zealand Projects

Key findings
emerging from the
Pathfinder Project
Programme

March 2010

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1 Introduction

In 2008, the New Zealand Constructing Clients' Group (CCG) established The Pathfinder Programme. Funded from the building Levy through Branz, (then Building Research) the scheme is designed to showcase great New Zealand Construction projects.

The concept is aimed at New Zealand construction industry organisations learning and sharing with each other to lift the overall standard of delivery, improve productivity and create Best Value.

A Pathfinder Project is a project or initiative that has, is, or will demonstrate innovation, good practice and success in delivery of a construction product, be it road or building.

The case studies focus on repeatable ideas that can be shared around the industry. The long term goal of the programme is to act as an aid to boost performance.

This report is a study on the findings from the case studies to date of what makes a really Great Project.

For further information on the Pathfinder Programme and to download case studies and presentations, visit www.constructing.co.nz

2 Benefits

The following benefits have emerged from the Pathfinder case studies produced to date. The benefits enjoyed by clients and their supply chain have been derived through innovation or the adoption of local and international best practice in New Zealand and include:

Improved product

- Outcomes which better meet the original and evolving needs
- Fewer defects in delivery and future operation
- Earlier delivery and improved transition to operation
- Enhanced customer satisfaction
- Quicker concept to completion cycles through improved engagement with supplier
- Improved defect remediation
- More effective decision making facilitated through openly sharing issues, ideas and information.

Added value

- More appropriate selection in quality and specification to meet the anticipated life span.
- Better balance of capital and revenue investment deployment
- Lower lifecycle cost of ownership
- Appropriate flexibility and adaptability to suite anticipated futures
- Reduced cost of transactions
- Opportunities to benefit from economies of scale and recovery of unnecessary tender costs
- More realistic risk profiles
- Reduced project insurance costs and simpler recovery processes and guarantees
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Greater predictability

- Seamless planning and implementation
- Clarity of programme progress
- Minimised risks of misunderstandings
- Avoidance of delays and overspends
- Improved component and material delivery through better scheduling and inventory management
- An open and honest environment capable of eliminating unpleasant surprises
- More certainty in cash flows and less credit needs

Fulfilling environment

- Safer, more respectful and supportive climate
- Opportunity to be consulted and involved in decisions
- Clarity on levels of empowerment and authority to act
- Culture of mutual enjoyment and success
- Minimised focus on litigation freeing individuals and companies to focus on performance
- Continuity of employment and the opportunity to build long term relationship based on mutual trust

Learning culture

- Encouraging questioning and challenging to improved understanding
- Opportunity to offer alternatives and to innovate
- Freedom for personal growth and accountability
- Continuously improving processes, methods and outcomes
- Design solutions which are easier to manufacture and construct
- More focused and efficient research and development with reducing development timescales
- Opportunity to learn from own and others mistakes

In theory it should be possible with good client leadership and excellent management practices practised by all the supply chain including the client to achieve these benefits, however, experience is showing that the way in which the team is put together and the point at which each player comes into the project has a large impact on the whole teams ability to deliver these benefits.

What is also becoming clear is that it is more important to ensure that certain emerging Best Practice themes are in place in order to achieve these benefits, the procurement model is merely a method of facilitating these best practice themes. Some of the models are designed to encourage these best practices and hence make it easier for the team to carry them out, whilst some models present hurdles to the team which make it more difficult to practice the themes.

It is also important to note that there is an underlying – and often dangerous – assumption that clients and their supply chain partners are capable of working in a more integrated and collaborative fashion. Throughout any process to decide on a procurement method clients and suppliers should objectively examine their capability to support the desired model. The test is relatively simple – are we demonstrating the behaviours and thinking across our own organisation?

This in part reinforces that fact that, even with the least integrated procurement model, i.e. Lowest Price Competition, it is still possible with good client stewardship to achieve an excellent outcome. Two of the Pathfinder case studies demonstrate this. However, these clients did note that they found the procurement model to be a hindrance and required extra work to achieve good results 'in spite' of it.

3 Emerging Best Practice themes

Best practice definition:

A technique, method, process, activity, incentive or reward that will deliver a particular outcome more efficiently and effectively than any alternative technique, method, process, activity, incentive or reward activity available at the time. (Source NZTA Procurement manual)

Section 2 described the benefits emerging from Great Projects. This section describes the themes that equate to Best Practices that are emerging from the Pathfinder case studies.

It is becoming increasingly obvious that the best practice themes below are important contributors to achieving these benefits; even more important it seems than the actual procurement or delivery model, albeit a collaborative procurement and delivery model naturally instils most of these themes through its very nature.

UK experience concurs. The Local Government Task Force, (LGTF) toolkit does not specify a procurement model, rather lists a series of best practices that should be in place. It asks that the authority follow the best practice guidelines and innovate on the most appropriate delivery model which should always involve early involvement and the intention to develop long term benefits. Probity and accountability are paramount and the decision process well documented. Beyond this, the tool kit is not more prescriptive. Performance Measurement is fundamental to this approach in order to demonstrate Best Value. Without it, probity and accountability cannot be satisfied.

Best Practice Themes

The following best practice themes have emerged from the Pathfinder Project Case Studies. They include:

- **Selection of team members**
- **Collaborative approach**
- **Early involvement of contractor**
- **Alignment of project goals**
- **Performance culture**
- **Collaborative Planning**
- **Lean Construction)**
- **BIM Technology**
- **Informed 'intelligent clients'**
- **Whole of Life**
- **Best Practice:**
 - Cost management
 - Time management
 - Quality Management
 - Risk Management
- **Long Term Relationships**
- **Training, workshops and team building events**
- **Sustainability**
- **Sharing of Knowledge**
- **Health and Safety focus**

Selection of team members

Team selection is based on companies and more specifically, people's experience, skills, ability to work together and proven quality of work rather than on price alone.

Collaborative approach

To help establish a collaborative approach it is ideal that the formal structure, i.e. the delivery model, selection method and form of contract matches the way of working. Otherwise the next best step is to create an informal charter that overrides the contract on a day-to-day basis.

The LGTF toolkit (Appendix G) recommends this approach. The incentive for suppliers to maintain the informal charter as it is generally not contractual is that of repeat work. This incentive should never be underestimated by the client.

With either method the following principles and procedures are established to help support and sustain a healthy collaborative environment. These are, having transparent and open communication, where team members respect each others' knowledge and are willing to listen and learn from each other. People are expected to contribute beyond demarcated disciplines. This is helped by establishing a flat hierarchy, where facilitative leadership is encouraged. A 'no blame culture' is part of the principles behind sustaining a cooperative environment, where people are expected to admit mistakes and work together to find a solution.

Continuous reporting helps communicate the status of the project, as well as pre-start workshops, induction workshops, toolbox meetings and other forms of helping inform people of the project's goals, objectives and programme as well as giving a forum for being able to contribute to finding innovative solutions.

Early involvement of Contractor

The growing complexity of building demands collaboration as no one discipline has sufficient skills or knowledge to understand the consequences of the whole process. In particular today with the driver of environmental sustainability, where innovation has never been so important.

Integrating the design and construction has been found to help improve efficiency, shorten construction periods and reduce waste. The Contractor is able to provide construction expertise during development of design documentation, particularly around buildability issues. Often the contractor is paid a fee at the appropriate stage in the design for advice. Procurement methods still allow for a tender process to then select the contractor to build the project should that be deemed necessary, although best practice would be to retain the original team. This is sometimes called two-stage tendering.

Alignment of project goals

By bringing the Project Team together at the start of the project to collectively agree to key objectives and performance measures helps create a shared purpose and ensures that everyone works towards the same goal. It has the additional advantage of clarifying what the expected outcome is and makes decision making easier as everyone can base their decisions on the agreed objectives.

This in turn empowers people and flattens the hierarchy as a wider tier of people can validate decision-making. This helps bring a sense of commitment to those working on the project, as people know that their efforts are contributing to the outcome. It also supports continuous improvement, as by measuring the performance you are able to identify ways of improving practice and procedure.

It has been found to be particularly helpful to have the client speak personally to as wide a group of individuals as possible about their personal goals and drivers. People respond to this and feel very much a part of the team. Too little has been made of the requirement for individuals to feel 'heart and soul' in their work in the past. Formality of business has precluded the idea that feelings might drive behaviours. Best practice now recognises people's personal drivers which most often place sense of achievement above salary.

Performance Culture

Part of the alignment process is establishing key performance measures that will be measured throughout project and demonstrate whether the project or programme is keeping to its goals. Performance measures are the key indicators of what is valued by the Project Team. These are ideally created by the team with the client in a workshop. Basic indicators are performance in time, cost quality, satisfaction of client and team and health and safety. The Alpart case study demonstrates how the inclusion of an environment set of measures drove innovation in that area.

It cannot be underestimated how important Performance Measures are in a collaborative procurement model. They form the tool which demonstrates whether the project is achieving best value and allay people's fears about moving away from lowest price. Used properly, the measures are both lead and lag and results direct decisions on a daily basis to steer the project on course.

For example, the Hertford City Council case study demonstrates how the client used the measures to set targets which the suppliers needed to meet each year to remain framework suppliers. QLDC is using the same approach but it is too early in their process for a case study as yet.

Collaborative Planning (use of technology BIM)

At both design and construction stage forward planning is strongly recommended. It involves the Project Team considering aspects such as material selection, lifecycle analysis, waste management, health and safety issues, work plans and commissioning targets. Coordination issues are identified ahead of construction on site, which significantly minimizes delays and the cost of rework.

BIM: Of particular assistance to this is the use of BIM or Building Information Modelling. BIM could be the single biggest innovation in our time which transforms the building process. It essentially allows for the building to be constructed twice – once virtually and once on site.

This means that the biggest complaint of the industry – the fact building is a prototype as it is the first one of its type to be built (with some obvious exceptions), examples have shown dramatic reduction in construction time through rigorous testing of options which the whole team can contribute.

One such example at a conference in Australia was the replacement of a 3+3 lane bridge in Seattle. The bridge replacement would normally have closed the road for a month or more. Using BIM, the total closure time was 72 hours, each minute planned meticulously.

As part of forward planning, ongoing regular review processes such as assessing costs, programme, risk register and health and safety are established with the aim of keeping one step ahead of the work and also finding ways towards continuously improving practices and procedures. BIM models can also used to manage time and cost and project team can run simulations and show where the project should be at any calendar date and how much should have been spent. This is known as 5 D modelling.

The **Lean Construction tool, Last Planner** is gaining increased use throughout New Zealand which is proving a fertile ground to the tool. Its take-up has been relatively rapid since being introduced in 2005 compared to the UK, proving that New Zealand can quickly move ahead of the game when it comes to innovation.

The case study The Plaza demonstrates the use of both these tools and although it is early days in the life of the project, the findings are positive so far.

Informed 'Intelligent' clients

Informed or 'Intelligent clients are key to a successful outcome as they are able to clearly articulate their requirements and key drivers. The word 'intelligent client is a term which describes a client organisation which has employed industry professionals on its in-house team to manage the whole procurement and delivery process.

These clients are active throughout the whole project delivery and in all key decisions. They are project focused and conscious of time and how it affects the process and therefore the importance of making decisions in a timely manner.

Intelligent clients are aware of the advantages of being transparent and proactive in creating open

dialogue with stakeholders. They also foster a commitment to sustainability and demonstrate leadership. Often client organisations complain that they are not able to maintain these individuals permanently as their portfolio goes through cycles. For public sector clients, one idea maybe to create a central pool of highly trained intelligent client individuals.

Whole of Life

As part of the agreed objectives, a commitment to sustainability means that costs are based on **Whole Life Cycle** approach rather than on initial costs of construction. It has been demonstrated that for every \$1 spent on capital construction, \$5 are spent on maintain the building through its life and \$200 are spent on the resource housed by the facility. Interestingly, \$0.1 is spent on the design process. Best practice shifts this equation so that more is spent on the design phase and construction phase to receive a bigger pay-off during the life of the building.

Leading thinkers have also recognised the importance of the design of the building in the productivity of the work force. Studies have shown that two single factors impact productivity in the workplace – natural light and air quality. Therefore, spending more in the design and construction stages to focus the facility in delivering productive workplaces is again a further example of how the leading clients are thinking when it comes to their requirements and realising them.

This begins to be a long way from the concern purely of the lowest priced contractor; these clients are seeking innovative companies who can bring intelligence and creativity to the party. The pay-offs in \$\$\$ downstream are far great than the relatively small potential \$ saving by going to the cheapest price, which often does not end up being the cheapest anyway as described in section 2.3.1.

BIM models are now capable of maximising whole of life development and can model scenarios in advance of designing permanent features.

Cost Management

To help sustain a collaborative approach, it is important that the Project team manages and communicates costs with each other in a transparent and honest manner. It is particularly helpful to have established as part of the policies '**Open Book Policy**', as this ensures clear accountability. Costs are managed collaboratively, rather than separately.

The implementation of **gain share/pain share** or other such incentive mechanism with the whole team acts as an economic commercial driver to help align people together. It creates an incentive to help each other and be constantly vigilant towards improving the whole process.

Of equal importance is a good change management tool which helps the team predict outfall effects of change. The use of BIM with a good cost model is useful for this.

Time Management

Best practice projects demonstrate time KPIs on walls and around the site office. The teams use collaborative planning and often Last Planner meetings to ensure the project is kept on track. The best projects are managed in this way in a clam predictable manner; the atmosphere is entirely different to traditional project where the atmosphere and attitude of the team can be one of fire fighting and stress.

Quality Management

A key performance measure in realizing best practice is the Project Team achieving an excellent quality of finish. Often, as part of this, the team work towards a zero defect target at Practical Completion. The Architect and Contractor pre inspect the building together on a regular basis to minimize the defects list at Practical Completion.

Key to the success of the project and retaining positive relationships with the client is the team resolving defects quickly and efficiently. Naylor Love has taken a proactive approach to this and has developed a

suite of internal tools to help eliminate defects. They actively measure this area and involve the client and the architect.

Best practice quality management begins with choosing suppliers who themselves, have best practice or quality systems. Gathering the team around the project early helps to establish the projects quality systems.

Risk Management

Risk management involves understanding and managing risk of all performance measures identified by the team as important, i.e., cost, time, quality, health and safety and environment. It is useful to create one consolidated Risk Register, usually established at a workshop that involves the key Project Team. The whole team collectively works together to identify, avoid, mitigate and/or minimize all foreseeable risk. This Risk Register is monitored and reported on throughout the whole process and therefore stays as a 'live' document.

Collaborative working enables a much better chance to decide which parties are best able to manage the project risks and decide appropriate risk/allocation/risk sharing.

Development of long-term relationships

Adopting a practice of working towards long-term relationships helps build trust and collaborative practice. To maintain this requires open, honest and fair practice which encourages respect and the willingness to listen to each other. It has been demonstrated that it has the advantage of reducing costs, enhancing quality, reducing risk and providing opportunities to innovate

Long term relationships also MUST have good performance measures as this is the tool which delivers probity. . A team which is reducing costs and increasingly quality year on year can demonstrate delivery of best value for example.

Part of this practice is also recognizing the importance of introducing new members to the team to stimulate and challenge thinking, yet without impacting on the overall stability of the team. The Hertfordshire County Council case study is a good example of this.

There is also an art in establishing the right number of relationships to maintain to ensure the market is stimulated and there is not a reliance on sole supply or a mutual reliance by the supplier on the client should the programme cease for any reason. A rule of thumb generally used is to provide no more than 25% to 30% of the supplier's annual turnover. This is enough to ensure that the client gains sufficient 'off-line' innovation time from the supplier (added value) yet does not create too strong a dependency on either party.

Hertford chose 5 suppliers of differing sizes to deliver differing size projects. This method also encourages the use of local contractors, employing say 4 or 5 to deliver a programme of small projects rather than perhaps employing a national contractor to deliver the whole programme.

In the future in times of peak oil, local resilience will become increasingly important. Some clients in the UK award additional points to local companies when acquiring framework or panel suppliers.

Training, workshops and team building events

A strong emphasis on implementing training and workshops to up skill inter-personal skills or technical knowledge has been demonstrated to add significant value to project and help in stimulating innovation within the project and construction industry. As part of this, prestart and induction workshops inform and create greater alignment with those involved in the project. It helps inform people why certain procedures and policies are in place and identifies how individual efforts can contribute to the performance measures and therefore a successful outcome.

This is a very important element of building a best practice project team. Long term relationship teams need to allow time to have regular off-line' workshops to review progress, measures and come up with ideas for continuous improvement. It has been demonstrated that \$ previously spent in tendering are now being spent on these innovation workshops in long term relationships. This is an excellent example of a wasteful activity being replaced by a value adding activity at no additional cost to any of the team

members.

Celebrating with the team key milestones helps build relationships and acknowledges people's commitment to realizing the goal.

Team building and development recognizes that a team needs to constantly learn how to effectively work together and ensure a unified purpose. To sustain the alignment and develop team building, additional workshops and post-evaluation workshops are recommended. Coaching and mentoring also helps change entrenched defensive behaviours.

In the UK, BAA took this so seriously that they employed a full time team to train their supply chain in various project and business skills in preparation for T5. AN investment which returned them cost and time certainty across an enormous 7.5Bn GBP project which is highly unusual.

It is important in the new era of construction that clients begin to think of themselves as investors in their supply chains. Other industries such as the car and oil and gas industries, banking in the UK have adopted this approach with industry changing outcomes. It is an entirely different way of working and thinking.

Sustainability

There is a rapid upsurge in the understanding of our need to tread more lightly on the planet. The built environment has a huge opportunity to assist with this. The ANZ bank case study shows what can be achieved with a supply chain using relatively simple approaches and a team spirit based on collaboration. A future Pathfinder case study, the Meridian HQ in Wellington demonstrates how a building can be completely developed using sustainable principles. This project was New Zealand's' first 5 Star Green building.

The principles of sustainability are so important and so wide reaching throughout the supply chain that the author believes they will form the biggest single driver towards collaboration which the industry has yet seen.

The level of innovation required necessitates a team approach with all skills and expertise on board. It is vital that clients and suppliers being to skill up in this area.

Sharing of knowledge

Hand-in-hand with a collaborative culture is the willingness to share knowledge with other disciplines within the Project Team and ultimately within the industry so that people can gain from their experiences.

The Pathfinder Projects have all agreed to share their findings in an open manner.

One potential barrier to sharing has been that suppliers are worried about their 'IP'. The UK reform movement has completely broken that barrier as companies began very quickly to recognise that for every idea they shared, a hundred fold were gained. In addition that it was very near impossible for competitors to catch up with you if you shared an innovation that you have fully implemented.

The culture for sharing was one of the biggest differences which was described by visitors on the 2006 study tour with BRANZ.

Health and Safety

Establishing excellent health and safety procedures has many positive side-effects, apart from the obvious one of protecting the people working on the site. What has been demonstrated is that it promotes cleaner and tidier sites and forward planning. This in turn creates greater productivity as fewer mistakes are made on site both in safety and in rework. It also has the added advantage of the Contractor being known in the industry for caring about those who work for them, which attracts people to work for them, establishing a positive virtuous cycle.

4 The Clients' Role

In considering improving productivity, too often, clients focus purely on the procurement model and less on the delivery model. Evidence has shown however, that the role of the client in the pre-planning stages is as important, if not more so in achieving value outcomes.

Toolkits

NZTA have recognised this and produced a 'Procurement Manual'*. A large part of the document is devoted to assisting the client in developing their strategic plan.

In 2000, following the report, Rethinking Construction, the UK's Local Government Task Force produced a Toolkit for local authorities designed to assist them through the whole procurement process which includes pre planning. It advocates the establishment of a joint pre-planning team which creates a rolling ten year plan and invites the industry to attend briefings to an informal "think-tank" to assist in the planning process. It also advocates 'early engagement' and sets out clear step by step guidelines for achieving this.

Planning Horizons

One of the biggest problems the industry faces is the recognised short planning window which is some of the shortest in industry wide – around one year or less. Where clients can give some indication of their requirements over a longer time frame, the supply chain can respond through its own business planning which leads to less staff churn and the ability to invest in staff training over time.

In section, 2.2, we described how clients in the UK have developed a model to create simulations based on good intelligence about forward pipelines of work to assess the potential inflationary effect (and impact on skills shortages) of mega-projects and to phase work to either delay or advance it to smooth workloads and avoid to some extent procuring projects at times of high tender prices.

Client Collaboration

In New Zealand, clients often act in isolation; this can lead to the boom bust nature of the industry. There are many benefits to be gained by cooperating. In 2003/4, Vector led a client side partnership with other clients to place services underground. Benefits include bulk buying, efficiencies of operation, sharing knowledge, packaging work to provide better incentive to the supply chain, sharing knowledgeable, 'intelligent' staff where budgets preclude full time employment of such.

Best Practice Client

During Procurement, evidence has shown that clients play a vital role in the establishment of value and achievement of productivity, (e.g. Hopkirk Research Institute case study, Appendix B).

In 2006, NZ CCG produced a Client Charter working with a group of clients and industry which describes a 'Best Practice Client'. Key to this and unanimously recognised by all is that the client should employ personnel who understand and have experience in the procurement and construction process, (Intelligent Clients).

In 2009, NZ CCG produced a suite of 'Client Protocols' to be rolled out from March 23rd 2010.

Whole of Life

Section 2.2 described the importance of consideration towards whole of life, from the perspective of both maintenance and the performance and productivity of the people the facility houses. The 1:5:200 illustrated the relative cost and value of these stages in the product's lifecycle.

Supply Chain Needs

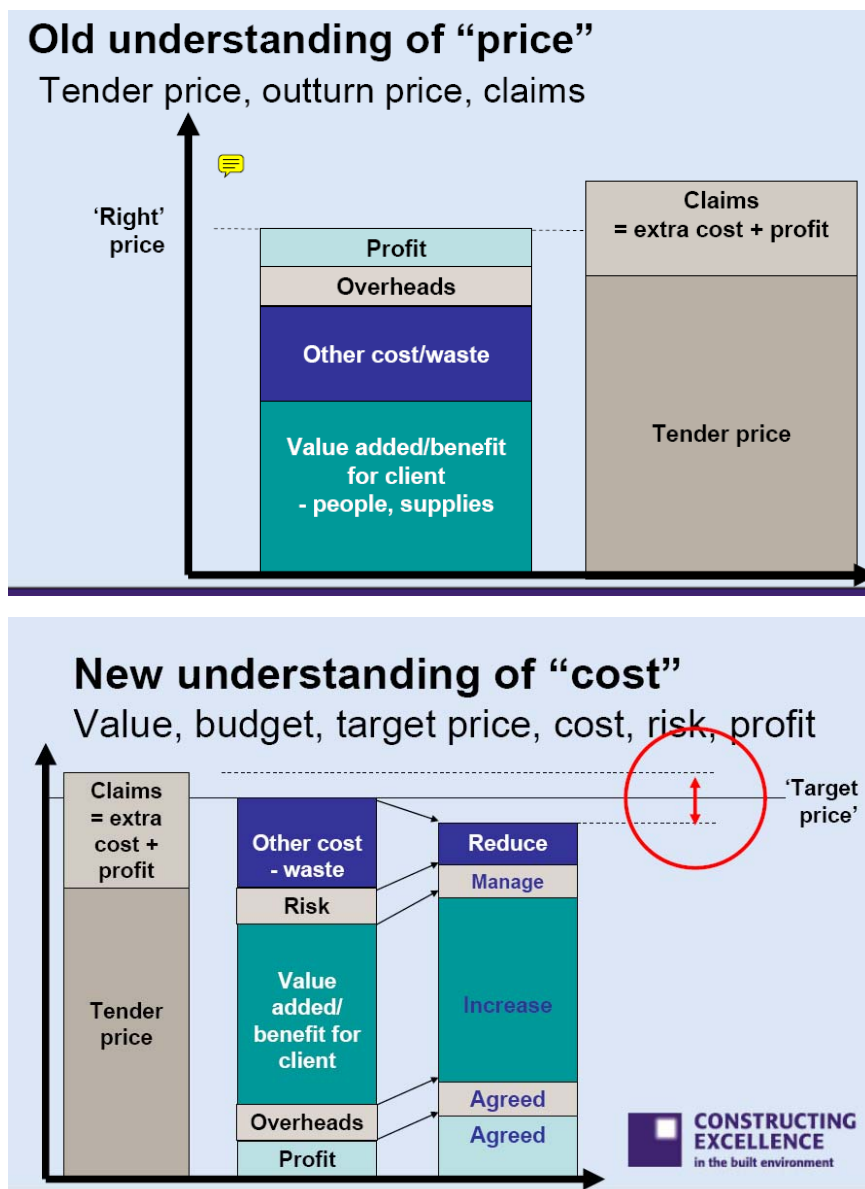
It is critical that clients recognise the needs of their supply chain in order to create win-win relationships. In 2002, some 300 Managing Directors of UK supply chain members were surveyed in order to find out the most important aspects of client relationship for them.

The results were interesting in that 'early involvement' was a clear leader. Perhaps not so surprising when considering the business imperative to be able to plan forward workload. The list of key needs was as follows:

- Early Involvement
- Knowledge of Forward Workload
- Feedback
- Post Project Review
- Consistent Relationship
- Selection on 'Best Value'
- Better coordination of trades
- More negotiated work
- Open communication
- Reduced retentions for mature relationships

Cost versus Price

Many clients do not understand the relationship between cost and price. During his visit to NZ, Don Ward described this relationship which is summarised in figure 14 below:



4.1 Procurement Models and Best Practice Themes

The table below has been used to map the various procurement models available across to the Best Practice themes.

Delivery Model	Traditional Lowest price conforming	Traditional Design/Build	Traditional Negotiated Tender *	Management Contracting	Traditional Informal Collaboration	Framework Agreement	Collaborative Working Arrangement	Alliance
Health & Safety	2	3	4	2	5	5	5	5
Selection of Team	1	2	4	2	3	5	5	5
Collaborative Approach	1	1	4	2	4	5	5	5
Alignment of Project Goals	1	1	3	3	4	5	5	5
Forward Planning	1	4	3	2	4	5	5	5
Intelligent Clients	1	1	3	3	4	5	5	5
Early Cont. Involvement	1	3	2	4	3	5	5	5
Cost Management	1	4	3	4	4	5	5	5
Time Management	3	4	3	4	4	5	5	5
Quality Management	1	2	4	4	4	5	5	5
Shared Risk Management	1	1	2	2	3	5	5	5
Development of long-term relationships	1	2	5	3	3	5	5	5
Training, workshops & Team bldg	1	1	2	3	4	5	5	5
Waste Management	1	1	3	3	4	5	5	5
Sharing of Knowledge	1	1	4	3	4	5	5	5

Table 2 - Does the procurement route support, encourage and sustain best practice?

Scale: 1 = strongly disagree, 2 = Disagree agree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree

*negotiated tender: where typically three preferred contractors are requested to price. The contractors generally have established relationships with the Tenderer, and whose experience, quality of work and willingness to work together is known