National Museum of Australia, Acton Peninsula, Canberra: A Case Study

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1.0 Introduction

The National Museum of Australia project at Acton Peninsula, Canberra, was the first major public building project in which clients joined with members of the design and construction team in an innovative ‘Project Alliance’ to deliver a public building. The ground-breaking procurement method has proven to be effective in delivering a highly successful project which was delivered on time and on budget, to the project brief and intended quality.

This report attempts to summarise the distinctive features of the Acton Peninsula Project Alliance and the implications for a re-engineered delivery process.

This case study report is based on the primary research and subsequent final report (Hampson, Peters, Walker, Tucker, Mohamed, Ambrose and Johnston, 2001) carried out by the Construction Research Alliance (CRA) team with a grant from the Department of Industry Science and Resources. Research team participants were the QUT School of Construction Management and Property, CSIRO Building, Construction and Engineering, and RMIT Building and Construction Economics. The case study research conducted by the CRA on behalf of the federal government had a dual focus: firstly, the application of the alliancing method of project delivery; and secondly, the use of information technology in design, construction, and project management.

The $155million project was undertaken by the client and fellow alliance partners with great “will to succeed”. No established methodology and no comparative data was available to the proponents who now may be said to have set the benchmark for project alliancing on construction projects.

The museum opened in March 2001 to acclaim as the centre piece of Australia’s Centenary of Federation celebrations.

1.1 Project information summary

The following table gives an overview of the size and scale of the project.

<table>
<thead>
<tr>
<th>Project Name</th>
<th>The National Museum of Australia Complex</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;</td>
<td>Australian Institute of Aboriginal and Torres Strait Islander Studies (AIATSIS) 6,180sqm.</td>
</tr>
<tr>
<td>&quot;</td>
<td>External works and landscaping 77,704 sqm.</td>
</tr>
<tr>
<td>Delivery Method</td>
<td>Project Alliancing</td>
</tr>
<tr>
<td>Project Budget</td>
<td>$155,000,000</td>
</tr>
</tbody>
</table>

○ Table 1. Summary of project data

1.2 Multiple stakeholders

The seven members of the Acton Peninsula Alliance were:

- The Commonwealth Department of Communications, Information Technology and the Arts (DOCITA),
• The ACT Government,
• Ashton Raggatt McDougall and Robert Peck von Hartel Trethewan, architects in association,
• Bovis Lend Lease (formerly Civil and Civic), building contractor.
• Tyco International Pty Ltd, services contractor.
• Honeywell Ltd, services contractor, and
• Anway and Company, exhibition designers.

Some key consultants were not part of the alliance, for example Ove Arup and Partners, structural engineers. This omission was later viewed by the alliance as a missed opportunity. (Eggleton 2001, Wright 2001)

Sub-alliances with various service providers replaced traditional sub-contracts. Steelwork, aluminium façade systems, audio-visual and information technology, landscaping and exhibition joinery were procured via sub-alliances.

The workforce was also included in the commitment to alliancing through a Project Agreement negotiated with unions. The agreement included performance-based bonus payments on a sliding scale.

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**Figure 1. Alliance structure for the procurement of the Museum of Australia.**

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1.3 **Architectural Design**

Ashton Raggatt McDougall, architects in association with Robert Peck von Hartel Trethewan won the international competition to design the National Museum of Australia and the Australian Institute of Aboriginal and Torres Strait Islander Studies in 1997.
The distinctive design of the complex was an intrinsic factor in the delivery of the project. The design presented various construction and fabrication challenges for the alliance which were met with innovative solutions.

The complex of buildings curve in an arc around the Acton Peninsula on Lake Burley Griffin, in clear view of the Australian Parliament House.

The buildings are geometrically complex and incorporate large propped spans of approximately thirty metres. Columns and walls are angled in multiple directions. Curved façade treatments unfold along these sloped surfaces which are the external abstraction of an internal “knot surface” developed by the design architects. The knot surface protrudes through the roof and side walls and these protrusions form the skylights and bay windows respectively. (Munter, 2000). Facades include aluminium panels, steel plate cladding, glass and concrete panels.

2.0 Development of Project Alliancing

The Acton Peninsula Project was the first construction project to use Project Alliancing. However the concept was pioneered in the development of the North Sea oil and gas industry, particularly by British Petroleum. In Australia during the mid 1990’s project alliances were adopted for three major mining projects in Western Australia, notably the Wandoon oil alliance contract for Ampolex. In the late 1990’s project alliance contracts were used on major infrastructure projects such as the NSW Rail Access Corporation rail maintenance contracts, and the Sydney Water Corporation Northside Storage Tunnel project.

Abrahams and Cullen (1998) define a project alliance as “an agreement between two or more entities which undertake to work cooperatively, on the basis of sharing of project risk and reward, for the purpose of good faith and trust and an open-book approach towards costs”. Walker, Hampson and Peters (2001) describe alliancing as a joint commitment where parties agree their contribution levels and required profit beforehand and then place these “at risk”. If one party in the alliance under-performs then all other alliance partners are at risk of losing their rewards (profit and incentives) and could even share losses according to the agreed project painsharing/gainsharing model.

The alliancing approach offers attractive advantages, particularly for clients (Anon, ACLN 61:1998):

- Best practice benchmarks easier to achieve through an incentive structure;
- Differences of opinion easier to resolve than under other contract forms;
- Lower contract administration costs;
- Lower costs in developing performance-based outcomes, compared with the costs of developing prescriptive scopes of work;
- Opportunities and incentives to innovate,
- Opportunities to reduce duplication and achieve efficiencies.
• Avoidance of the high cost normally associated with out-sourcing of risks;
• A greater ability to vary the scope of work;
• A greater ability by the owners to focus on its core business.

3.0 The motivation for an alliance
Alliance contracting is suitable for a one-off project when the following circumstances exist (Anon, ACLN 61:1998):
  ▪ At the outset of the project, the owner cannot specify its needs clearly enough for a lump sum tender to be made;
  ▪ The contractor is reluctant to put a firm price on long-term risks;
  ▪ The owner needs flexible access to the contractor’s resources.

These triggers and certain client business needs existed in the case of the Museum of Australia project. DOCITA’s Policy Arts Dept carried out extensive research on suitable project delivery strategies and found that the particular requirements of this project could not be met by other approaches. The CRA team summarised the following issues that influenced the selection of the project alliance delivery strategy:

• Cost. The Commonwealth allocated a fixed budget within which total project delivery was to be achieved. Participants were keen to avoid cost overruns such as those associated with previous landmark Australian public projects. An alliance contract could be drafted to impose strong financial penalties for cost overruns.

• Delivery of the project on time was imperative. The proposed museum was intended to be the major focus of the Centenary of Federation celebrations in 2001. As a major new public building it was scheduled to be opened by the Prime Minister of Australia on 12th March 2001.

• Full documentation in order to approach the market for tenders was impossible to achieve within the time frame available. Alliancing provided a viable alternative.

• A project of national significance demanded a quality outcome. The alliance approach would ensure effort could be focussed on producing outstanding results rather than on protecting contractual positions.

• Active client/user involvement was essential for the development of the brief and throughout the design process. The project integrated building envelope, services and exhibition design in total delivery system.

• Adoption of the alliancing approach would enable constructors’ “buildability” expertise to be incorporated throughout the design process to ensure the design was maximised, and costs kept within budget.
• Alliancing would enable a team approach to the complex management task of integrating the needs of client, designers and constructors to ensure alignment of goals and objectives.

• Alliancing would allow sharing of the high level of risk.

4.0 Fundamental requirements of a project alliance

Abrahams and Cullen (1998) say that successful alliancing is dependent upon the three key factors: the people, the commercial drivers, and the spirit within the alliance.

4.1 Best person for the job

The project team should be made up of the best individuals available for each project task. Individuals require the right mix of commitment, skill, motivation, integration, trust and teamwork. The alliance management must support these individuals to form an efficient team. (Abrahams and Cullen, 1998:31)

According to the CRA report (2001:29), people are so crucial to the success of the alliancing delivery process that they dominate the selection process which focuses on the prospective companies and their employees. This case study has not determined how individuals were selected for the various positions. The selection process for alliance partners is discussed in detail the CRA Report (Section A2.3). It is assumed that a strong commitment to the alliance from the chief executives of each participant ensured that their best individuals were available.

On the Acton Peninsula Project, team members were co-located in a single premises. This strategy helped to engender co-operation between the parties and fostered teamwork.

4.2 Commercial drivers – sharing of risks and rewards

The participants agree to share risks and rewards, measured by reference to key performance indicators. Most important is the “target cost” which represents the total estimated cost of bringing the project to completion. The target cost is established collaboratively by all the participants through an “open book” assessment of each participant’s anticipated costs. The risk/reward regime may also assess performance in other areas such as time, quality, safety, environmental issues or community relations. The alliance contract should provide very limited grounds for adjustment of commercial drivers, increasing the target cost or granting extensions of time. (Abrahams and Cullen, 1998:32)

The Acton Peninsula Project was characterised by an emphasis on Design Integrity and Quality. The CRA report (2001:51) noted that the project alliance had been established to reward participants on successfully achieving time, cost and quality. The concern was that an over-zealous team focussed on being innovative to achieve outstanding results in time, cost and quality might erode the original design intent. This potential erosion was considered unacceptable and so an independent Design Integrity Panel was formed to counterbalance the incentives to achieve other KPI’s. A $3million pool was set aside for
achievement of quality and design integrity to be shared amongst alliance partners proportionally.

4.3 Spirit within the alliance
The essence of a project alliance should be twofold: co-operation for the mutual benefit of the participants; and a focus on performance, not on reasons for non-performance. Commitment to the alliance requires an attitude of “what is best for the alliance is best for my organisation”. (Abrahams and Cullen, 1998:32)

The CRA study found that project team members were focussed on getting the job done on an interteam basis and were proactive in helping each other to achieve “best for project” outcomes. This was evidenced by:
- Negotiation style was more considerate
- Recognition of independence
- Higher expectations of self and others
- Collaborative teamwork
- Workforce rewards linked to performance
- Willingness to form sub-alliances. (Walker 2001)

Walker et al (2001) found that considerable effort was made to share information. The improved interaction that alliancing brings was found to be stimulating and to engender learning. Innovation and the continual exploration of options outside the immediately obvious solutions were encouraged by the alliancing milieu.

5.0 Selection of alliance partners
The rigorous process for selection of alliance partners devised by the Construction Co-ordination Committee (CCC) is described in detail in the CRA Case Study Report (Hampson et al, 2001: 16). According to the Report this process has since been used on several projects.

The twelve key selection criteria are summarised in the report as:

i. Demonstrated ability to complete the full scope of works including contributing to building, structural, mechanical and landscaping design.

ii. Demonstrated ability to minimise project capital and operating costs without sacrificing quality.

iii. Demonstrated ability to achieve outstanding quality results.

iv. Demonstrated ability to provide the necessary resources for the project and meet the project program.

v. Demonstrated ability to add value and bring innovation to the project.

vi. Demonstrated ability to achieve outstanding safety performance.

vii. Successful public relations and industry recognition.

viii. Demonstrated practical experience and philosophical approach in the areas of developing ecologically sustainability and environmental management.

ix. Demonstrated understanding and affinity for operating as a member of an alliance.
6.0 Alliance Management Structure

Two main entities formed the management structure: The Alliance Leadership Team, and the Project Management Team.

The Alliance Leadership team was the prime governing board of the alliance, with each member of the alliance appointing one or two people to sit on the board. The people on the team were key senior representatives of their companies. They were required to make the hard decisions, preferably without having to refer to their parent company. Decisions were to be made unanimously. The alliance principles were constantly revisited to enable the group to reach resolutions. Compromises were not encouraged as decisions were meant to be based on ‘best for project’ outcomes.

The Project Management Team was appointed by the ALT and comprised one or two representatives from each alliance member. The representatives are to be the best people for the project from the individual companies. The team operated as an integrated unit separate from their individual companies, in premises on the site. The Project Management Team was responsible for the day-to-day management of the project alliance. Members of the team reported to the Alliance Leadership Team.

7.0 Characteristics of the Acton Peninsula Alliance

- Design and documentation were carried out at an on site office.
- Although additional costs are involved in placing designers in the field, the net cost on the project is improved.
- Single virtual organisation team included design, constructor and client personnel.
- Professionals involved in the project were relieved of other organisational responsibilities.
- Suppliers were incorporated into the project team immediately after selection.
- Empowerment of workers, trades people, professionals at the project site through a negotiated Project Agreement with relevant unions.

7.1 Workforce empowerment – the Project Agreement

The workforce Project Agreement was tailor-made to suit the project alliance delivery approach by filtering the risk and reward structure based on time, cost, design integrity and quality used on the main alliance, to the workforce. The Agreement included the concept of performance based bonus payments. The traditional ‘site allowance’ was replaced by a sliding scale payment made upon proven performance based on productivity achievement. Each performance component was benchmarked and measured by an independent panel before
rewards were paid. A panel was comprised of an alliance partner, a subcontractor, an independent party, an employee representative and a subcontractor employee representative.

According to Peters (200) the benefits of the Project Agreement were:
- Employees reaped financial benefits and enjoyed a responsible and responsive work environment.
- A sound and innovative work culture.
- Improved productivity and quality.

8.0 Project team relationships
The following attributes characterised the Acton Peninsula Alliance Project team:
- a sharing of information, knowledge and skills,
- a co-operative fulfilment of obligations,
- mutual trust and respect,
- commitment to achieving gains through innovation,
- open book accounting,
- a non-adversarial culture, and
- common objectives and outcomes.

9.0 Information Technology and Information Exchange
This area proved fertile ground for innovation. It was obvious to the designers early in the design phase that a two-dimensional method of documentation would not be appropriate to convey the design of the structure, services and building envelope. The project required the creation of a full three-dimensional surface model which would be maintained as current real time documentation for use throughout the design, documentation and construction processes. The means of carrying out this innovative approach to contract documentation was the Project Web developed by Bovis Lend Lease.

9.1 Project Web
Project Web is a web site based document exchange and control application that allows the electronic exchange, storage and retrieval of information in many formats between the team members, in a fast and auditable way (Ashton, 2001). All the formal project data, including drawings, shop drawings, memos, instructions, RFI’s, schedules and so on were issued through Project Web. Team members had access to Project Web to whatever level was necessary for their particular role.

The ability to deal with this type of information exchange and a substantial commitment by the Alliance members was crucial to the orderly implementation of the Project Web innovation. Bovis Lend Lease maintained the Project Web, with responsibility for help desk, backing up and archiving.

In a series of seminars designed to disseminate information about the procurement of the National Museum, Steve Ashton (2001) outlined the many
advantages of Project Web for the design and construction of the complex project. The ongoing availability of the 3D surface model made possible:

- a wide range of representations of both exteriors and interiors to be produced on a regular basis for presentations and as a design tool;
- quick and accurate testing of design ideas; faster iterations were possible;
- recognition and resolution of complex constructional and detailing issues;
- faster, more efficient, high quality generation of information; redrawing for contract documentation was eliminated;
- accurate information for cost planning; for example surface areas of complex volumes.
- Quick generation of accurate set-outs for construction.

Project Web had many advantages in the management of supply chain issues. Ashton described how structural steel design, façade design, acoustic design, building services engineering, specialist lighting, exhibition design, and landscape architecture all benefited from, and were simplified by using the 3D model. Transfer to detailers and fabricators was efficient and effective, further translating to construction efficiency.

In a further innovation, the architects researched software which unfolds the 3D surfaces to create flat cutting patterns or panel sizes. This was used to build accurate physical models of the more complex design areas, as well as to communicate exact panel layouts to the façade contractors.

9.2 Achievements

Ashton (2001) noted that the degree of integration throughout the team and in particular the use of the accurate surface modelling (as opposed to the more usual visualisation techniques using general purpose rendering software such as 3D Studio) and the surface unfolding, was a first in Australia. The development of the Acton Peninsula project has significantly progressed the transfer of 3D information for construction projects.

9.3 Problem areas

Notwithstanding the outstanding success of the Project Web, Ashton (2001) identified some problem areas:

- Uploading and Downloading from Project Web can be slow due to limitations of both software and hardware;
- Surface software still not exact enough;
- Some design consultants and fabricators not geared to take full benefit;
- Industry margins and usual legal environment make Research and Development a hazardous activity.

9.4 Future Paradigm

Ashton points the way of the future in which new processes appear:

- the 3D model is the data repository for a project;
- all project information will be shared and manipulated by all participants through the maintenance of a full 3D model;
• the ultimate “design and construct” mechanism – a full description of the internal and external surfaces is provided as the design intent document, with total buildability flexibility in the spaces between.
• Full co-ordination of all services and structure done visually in 3D.
• Client design sign off on the basis of the 3D model.
• 2D drawings obsolete.

These processes see the full potential of Information Technology as a driver and catalyst for a truly re-engineered construction delivery process. Rather than “re-paving the cow path” by using new technology for time-worn processes, the use of evolving IT brings with it new ways of doing things in the construction industry. The use of the techniques outlined by Ashton signals the way for truly collaborative project procurement, requiring deeply committed client and project teams and whole-of-life approach to the design and construction of projects.

10.0 Project Outputs and factors which contributed to project success
The Acton Peninsular Alliance embodied the concepts which the DIST & NatBACC Procurement and Delivery Strategy Report (1998) noted as fundamental to the alliance approach.
• Entrenched positions which result from adoption of fixed and finite roles under other forms of contract are eliminated.
• Inefficient work processes which result in duplication of work are eliminated.
• Incentives are genuinely aligned amongst the parties,
• Outcome-based reward and the further refinement of tying ultimate project goals to success and remuneration. Strong financial penalties apply if targets are not achieved.

Mr Peter Wright, Bovis Lend Lease’s on site Project Manager offered these insights to the success of the project at a breakout session of the Sixth Annual conference of the CIIA Australia, held in Brisbane on the 23rd May, 2001.
• All alliance members participated positively in the process.
• All ideas were considered by the team in the pursuit of innovation.
• The team attitude was flexible and adaptable.
• IT platform using the internet was available to all and maintained.
• We provided a quality working environment.
• We co-located team members in the one office.
• We had lots of fun.
• We acknowledged individuals for their efforts.

10.1 Essential success factors
The factors that Abrahams and Cullen (1998) note are essential for the success of an alliance contract were present in the Museum of Australia project.
• a strong commitment to the alliance by the chief executive of each participant;
• An appropriate alliance structure;
• The best people for the project;
• Strong management during the course;
skilled facilitation;
reasonable commercial incentives;
adequate authority delegated to the participants’ representatives;
challenging objectives; and
the development and maintenance of an appropriate alliance culture.

10.2 Missed Opportunities
However, Wright (2001) identified factors which he terms “missed opportunities” which he says would have accrued further benefits for the project and participants:
- More sustained effort on innovation.
- Key consultants were not included as sub alliances.
- More sophisticated approach to acknowledgement for effort.
- Higher levels of team communication.

Garry Eggleton (2001) also identified areas for improvement:
- Users (NMA and AIATSIS) were not part of the Alliance.
- Incentive structure for the design team could have been improved:
  - More incentive for Architects/Exhibition Designers.
  - Other key designers could have been sub-alliances.
- Latent condition risk was not addressed adequately at TOC stage.
- Some sub-alliances were initially managed more like sub-contracts:
  - Innovation not fully encouraged/implemented.
  - Cost management based on trust rather than fact.

11.0 Innovation
As a result of the recommendations of the NatBacc Report 1998, the Commonwealth took a leading role in fostering new forms of industry groupings and delivery processes with the aim of industry reform and innovation.

The alliance process engendered innovation. Stephen Ashton, Project Director for the architectural joint venture for the Acton Peninsula project, observes that the fact that the Alliance structure protects the Alliance participants from legal action between themselves, has been a significant factor in enabling innovation to occur throughout the project delivery.

Ashton says that the Project Alliance structure has allowed the organisations involved to operate and to interact with each other synergistically, and free of the non-productive contractual behaviours commonly seen in the construction industry. Organisations have actively undertaken innovative research and development in finding solutions to suit the National Museum project.

Walker et al (2001) assert that the use of a quality panel to ensure that design integrity was maintained was an innovation worth noting. The operation of the independent panel seemed to generate a TQM rather than a QA ethos in the team. The results were tied to rewards. Walker et al believe that this strategy may solve some of the problems associated with D&C projects where the contractor
can ‘water down’ design features in the process of VM/VA and cost cutting/buildability.

12.0 Comparison with previous re-engineering studies

- Table 2. Re-engineering success factors

<table>
<thead>
<tr>
<th>T40 (Ireland 1994)</th>
<th>Comment on applicability to Museum of Australia process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agreed common goals</td>
<td>Client, contractor and consultants formed an alliance understood and supported each other’s objectives.</td>
</tr>
<tr>
<td>Simplified process</td>
<td>Owner, designer, builder, supplier, procurement and production integrated into one entity.</td>
</tr>
<tr>
<td>Re-engineered activities</td>
<td>Opportunities for reducing non-productive time between design and construct phases, particularly through IT using project web.</td>
</tr>
<tr>
<td>Workforce commitment</td>
<td>Excellence Agreement developed with the workforce where site allowance was paid based on a quality scoring system.</td>
</tr>
<tr>
<td>Partnering with local government</td>
<td>Local ACT government was a full alliance partner</td>
</tr>
<tr>
<td>Tendering on benchmarking</td>
<td>Selection on non-price criteria</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CSIRO (Mohamed and Yates 1995)</th>
<th>Comment on applicability to Museum of Australia process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strong commitment by the team to improving design and construction workflow</td>
<td>All project team members highly committed to project development, resolution and completion</td>
</tr>
<tr>
<td>Effective communications between major project participants</td>
<td>Communications integral part of the structure of the delivery system.</td>
</tr>
<tr>
<td>Positive involvement of customer at early stages</td>
<td>Client heavily involved with design team. Excellent user input. Requirements identified and implemented at planning stage</td>
</tr>
<tr>
<td>Quality assurance techniques</td>
<td>Integral to suppliers’ businesses – applied through all phases. Value-adding attitude.</td>
</tr>
<tr>
<td>Encouragement of innovation</td>
<td>Client lay groundwork for innovation. Project team delivered with an integrated design solution.</td>
</tr>
<tr>
<td>Improved construction output</td>
<td>Project completed on time. Budget, quality and service performed well.</td>
</tr>
</tbody>
</table>

Conclusion

The project was completed on time – the day before the official opening in March 2001 and within the original budget set in 1998. Walker et al (2001) note that the alliancing framework clearly encourages both cost and time outcomes that meet expectations. The risk/reward formula encourages this though on the Museum project, the national significance of the project and its remarkable design made it one that all parties wished to be seen as successful. No single work process was identified as a sole cause of significant reductions in schedule.
Rather, the cumulative impact of various strategies provided discernable impacts on project schedule.

The Museum of Australia case study has pointed to the potential benefits of the alliance approach to the procurement of large projects over the traditional contracting approach.

The project has been instructive in its success. Eggleton (2001) characterised the ‘business as usual’ attitudes (BAU) of client and contractor as a ‘misalignment of objectives.’ Eggleton sums up the BAU scenario where the potential for confrontation and conflict is heightened by entrenched attitudes such as:

<table>
<thead>
<tr>
<th>CLIENT</th>
<th>CONTRACTOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>We are the client and shall use the contract to obtain the maximum amount of scope for the cheapest possible cost, within the timeframe. We reserve the right to make any changes regardless of the cost and time implications for the Contractor and will use the contract to pay as little as possible for this change.</td>
<td>We are the contractor and shall use the contract to provide the minimum amount of scope for the maximum level of cost recovery. The risk of any time delays shall be passed onto the client via extension of time claims and we are entitled to a profit regardless of our performance in delivery the result.</td>
</tr>
</tbody>
</table>

On the other hand, Eggleton describes the attitudes engendered by the alliance approach as an alignment of objectives:

<table>
<thead>
<tr>
<th>CLIENT</th>
<th>CONTRACTOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>We are the client and we will participate in this project as an equal partner to deliver a ‘best for project’ outcome.</td>
<td>We are the contractor and we will participate in this project as an equal partner to deliver a ‘best for project’ outcome.</td>
</tr>
</tbody>
</table>
References:


